

# CONTRACTORS' & ENGINEERS' MONTHLY

A Purchasing Guide for Engineers, Contractors, Public  
Officials and Other Buyers of Construction Equipment.

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NOVEMBER 1921

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# Where to Purchase

A comprehensive Directory of the leading machinery and supply manufacturers arranged for the convenience of contractors, engineers, water-works superintendents, municipal and county engineering departments, street and highway officials, city managers, etc., and public officials who may desire to secure catalogs or prices on construction equipment. Where the name of a manufacturer is preceded by a star (\*) it indicates that the user of the directory may secure further information by referring to the manufacturer's advertisement in this issue. The index to advertisers will be found on page facing the inside back cover.

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Mundie Mfg. Co., Peru, Ill.  
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Schramm & Son, Inc., Chris. D., West Chester, Pa.  
Stratton & Bragg Co., Petersburg, Va.  
Sullivan Mch. Co., Chicago, Ill.  
United Iron Works, Kansas City, Mo.  
Westinghouse Trac. Brake Co., Wilmerding, Pa.  
Worthington Pump & Mch. Corp., N. Y. C.

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Guarantee Constr. Co., N. Y. C.  
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Jeffrey Mfg. Co., Columbus, Ohio.  
Kilbourne & Jacobs Mfg. Co., Columbus, O.  
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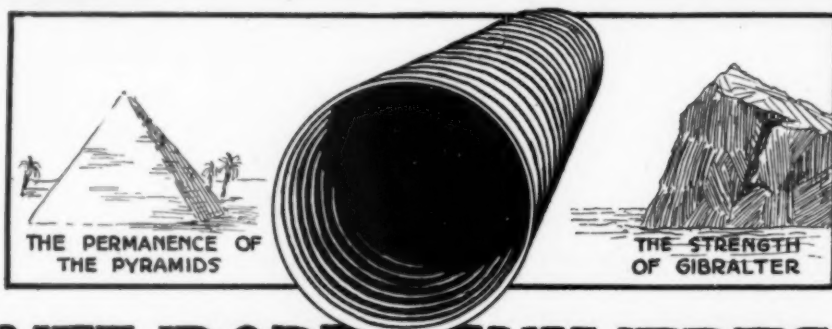
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Walsh & Weldner Boiler Co., Chattanooga, Tenn.

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Haydenville Co., Haydenville, Mass.  
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Inland Steel Co., Chicago, Ill.  
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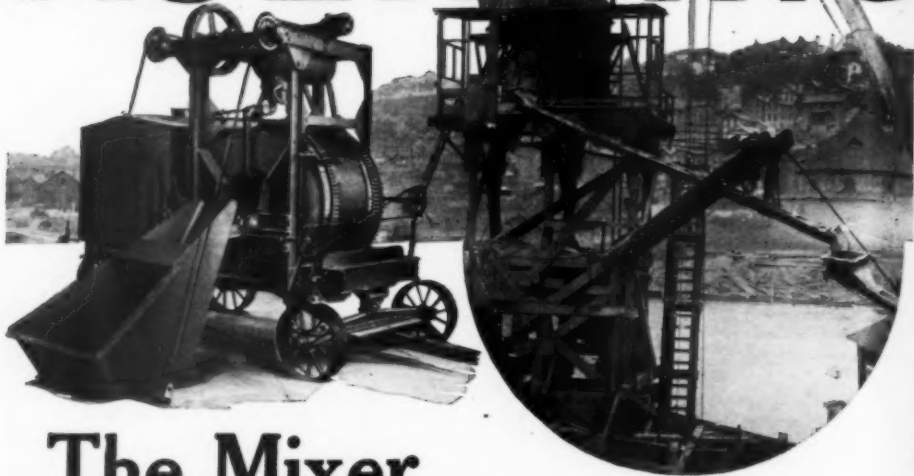
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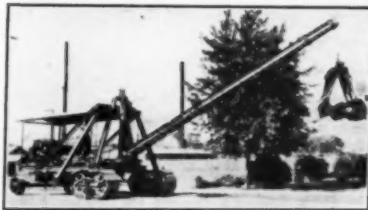
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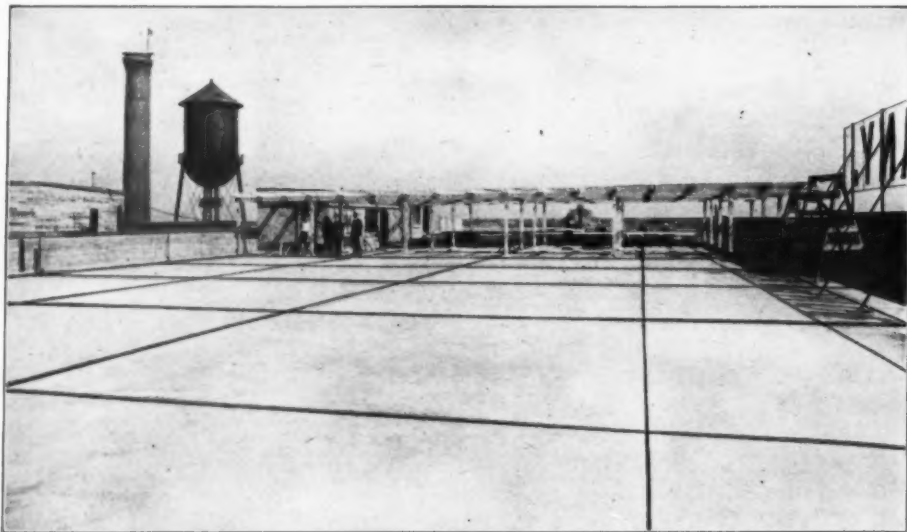
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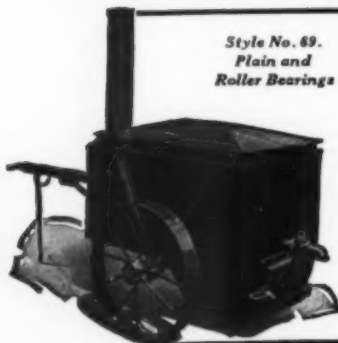
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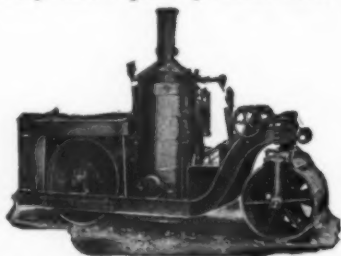
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\*Ransome Concrete Mach'y. Co., Dunellen, N. J.  
\*Standard Scale & Supply Co., Pittsburgh, Pa.  
American Cement Machine Co., Keokuk, Ia.  
Austin Machinery Corp'n, Chicago, Ill.  
Blaw-Knox Co., Pittsburgh, Pa.  
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Kent Machine Co., Kent, O.  
Lansing Co., Lansing, Mich.
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Smith Co., T. L., Milwaukee, Wis.
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\*General Motors Truck Co., Pontiac, Mich.  
\*International Motor Co., New York.  
\*Tiffin Wagon Co., Tiffin, O.  
\*White Co., Cleveland, Ohio.  
\*Winther Motor Truck Co., Kenosha, Wis.  
Acason Motor Truck Co., Detroit, Mich.  
Acme Motor Truck Co., Cadillac, Mich.  
All American Truck Co., Chicago, Ill.  
Atterbury Motor Car Co., Buffalo, N. Y.  
Bessemer Motor Truck Co., Grove City, Pa.  
Brookway Motor Truck Co., Cortland, N. Y.  
Clydesdale Motor Truck Co., Clyde, O.  
Corbitt Motor Truck Co., Henderson, No. Car.  
Denby Motor Truck Co., Detroit, Mich.  
Diamond T. Motor Car Co., Chicago, Ill.  
Duplex Truck Co., Lansing, Mich.  
Federal Motor Truck Co., Detroit, Mich.  
Four Wheel Drive Auto Co., Clintonville, Wis.  
Garford Motor Truck Co., Lima, O.  
Gary Motor Truck Co., Gary, Ind.  
Gramm Bernstein Motor Truck Co., Lima, O.  
Indiana Truck Corp'n., Marion, Ind.  
Jackson Motors Corp'n., Jackson, Mich.  
Kelly Springfield Motor Truck Co., Springfield, O.  
Kissel Motor Car Co., Hartford, Wis.  
Larrabee-Deyo Motor Tr. Co., Binghamton, N. Y.  
Nash Motors Co., Kenosha, Wis.  
Nelson Motor Truck Co., Saginaw, Mich.  
Packard Motor Car Co., Detroit, Mich.  
Pierce Arrow Motor Car Co., Buffalo, N. Y.  
Republie Motor Truck Co., Alma, Mich.  
Rowe Motor Mfg. Co., Lancaster, Pa.  
Selden Truck Corp'n., Rochester, N. Y.  
Service Motor Truck Co., Wabash, Ind.  
Sterling Motor Truck Co., Milwaukee, Wis.  
Stewart Motor Corp'n., Buffalo, N. Y.  
Titan Motor Truck Co., Milwaukee, Wis.  
Traffic Motor Truck Co., St. Louis, Mo.  
Transport Truck Co., Mt. Pleasant, Mich.  
U. S. Motor Truck Co., Cincinnati, O.  
Velle Motors Corp'n., Moline, Ill.  
Ward LaFrance Truck Co., Elmira, N. Y.  
Watson Products Corp'n., Cassadota, N. Y.  
Wilson Co., J. C., Detroit, Mich.
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Hydraulic Steelcraft Co., Cleveland, O.
- OAKUM**  
Wall Rope Works, Beverly, N. J.
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\*Barrett Co., New York.  
\*Pioneer Asphalt Co., Lawrenceville, Ill.  
\*Standard Oil Co. (Indiana), Chicago, Ill.  
Atlantic Refining & Asphalt Corp'n., Philadelphia  
Headley Good Roads Co., Philadelphia, Pa.  
Pierce Oil Corp., New York.  
Sinclair Refining Co., Chicago, Ill.  
Standard Oil Co. (La.), New Orleans, La.  
Standard Oil Co. (N. J.), Newark, N. J.  
Texas Company, New York.  
U. S. Asphalt Refining Co., New York.
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Leadite Co., The, Philadelphia, Pa.  
United Lead Company, New York.
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\*Barrett Co., New York.  
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Berry Bros., Detroit, Mich.  
Cook Paint & Varnish Co., Kansas City, Mo.  
Detroit Graphite Co., Detroit, Mich.  
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Dixon Crucible Co., Jos., Jersey City, N. J.  
Longman & Martinez, New York.  
Martin-Senour Co., Chicago, Ill.  
Minwax Co., New York.  
Protexol Corp'n., New York.  
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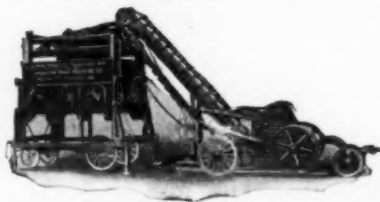
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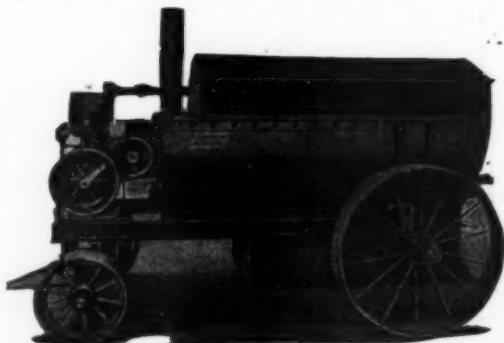


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 Wood & Co., R. D., Philadelphia, Pa.

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 Taylor Portable Steel Derrick Co., Chicago, Ill.

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 \*Waring-Underwood Co., Philadelphia, Pa.  
 Leadite Company, Inc., Philadelphia, Pa.  
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 Ruberoid Co., New York.

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 Russell Grader Mfg. Co., Minneapolis, Minn.  
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**PORTLAND CEMENT.** (See Cement.)

**POWDER.** (See Explosives.)

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 Indiana Air Pump Co., Indianapolis, Ind.  
 Ingersoll-Rand Co., New York.  
 Sullivan Machinery Co., Chicago, Ill.

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 De Laval Steam Turbine Co., E. Trenton, N. J.  
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 Gardner Governor Co., Quincy, Ill.  
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 Lea-Courtenay Co., Newark, N. J.  
 McGowan Co., J. H., Cincinnati, O.  
 Midwest Engine Co., Indianapolis, Ind.  
 Morris Machine Works, Baldwinsville, N. Y.  
 New York Eng. Co., New York.  
 Northern Fire App. Co., Minneapolis, Minn.  
 Novo Engine Co., Lansing, Mich.  
 Pulsometer Steam Pump Co., New York.  
 Schramm & Son, Inc., Chris. D., West Chester, Pa.  
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 Clark Co., H. W., Mattoon, Ill.  
 Cook, Inc., A. D., Lawrenceburg, Ind.  
 Deming Co., Salem, O.  
 Goulds Mfg. Co., Seneca Falls, N. Y.  
 Indiana Air Pump Co., Indianapolis, Ind.  
 Keystone Driller Co., Beaver Falls, Pa.  
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 \*American Well Works, Aurora, Ill.  
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 Buffalo Steam Pump Co., Buffalo, N. Y.  
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 Domestic Eng. & Pump Co., Shippensburg, Pa.  
 Morris Machine Works, Baldwinsville, N. Y.  
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- \*Nordberg Mfg. Co., Milwaukee, Wis.
- \*Northern Fire Apparatus Co., Minneapolis, Minn.
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- American Steam Pump Co., Battle Creek, Mich.
- American Well Works, Aurora, Ill.
- Barnes Mfg. Co., Mansfield, O.
- De Laval Steam Turbine Co., Trenton, N. J.
- Deming Co., Salem, O.
- Domestic Eng. & Pump Co., Shippensburg, Pa.
- Gardner Governor Co., Quincy, Ill.
- Gilbert & Barker Mfg. Co., Springfield, Mass.
- Goulds Mfg. Co., Seneca Falls, N. Y.
- Indiana Air Pump Co., Indianapolis, Ind.
- Lawrence Machine Co., Lawrence, Mass.
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- Weinman Pump Mfg. Co., Columbus, O.
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- \*Koppel Indus. Car & Equip. Co., Koppel, Pa.
- Bethlehem Steel Co., Bethlehem, Pa.
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- Carnegie Steel Co., Pittsburgh, Pa.
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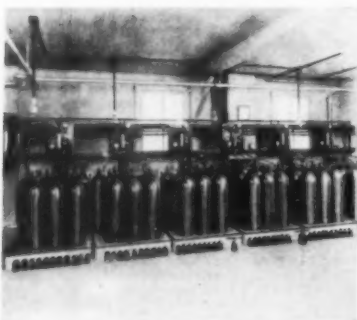
- \*Koppel Industrial Car & Equip. Co., Koppel, Pa.
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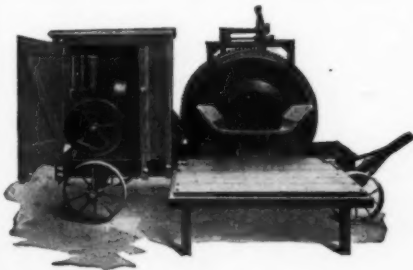
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## "THE STANDARD" LINE OF Contractors' Equipment

Concrete Mixers, Street Pavers, Hoists, Pumps, Gas, Gasoline and Oil Engines, Material Elevators, Spouting Equipment, Wheelbarrows, etc. Also wagon and motor truck scales. Send for Catalogue No. 69.

## THE STANDARD SCALE AND SUPPLY COMPANY

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# SEWER PIPE

CULVERT PIPE—  
WALL COPING—  
FLUE LINING—  
STOVE PIPE—



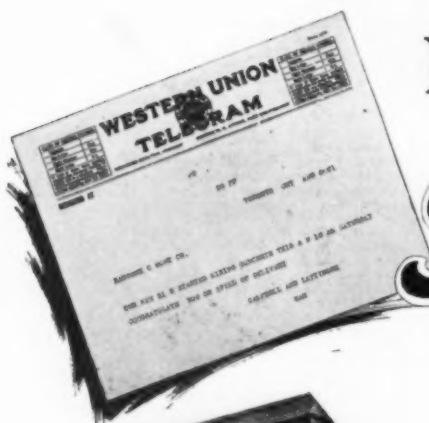
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Write for  
Information

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# Here's Service for You *Ransome* of course

July 30th Campbell & Lattimore, of Toronto, placed an order at the factory for a 21-E Ransome Paver to be sent to St. Catharines, Ontario.

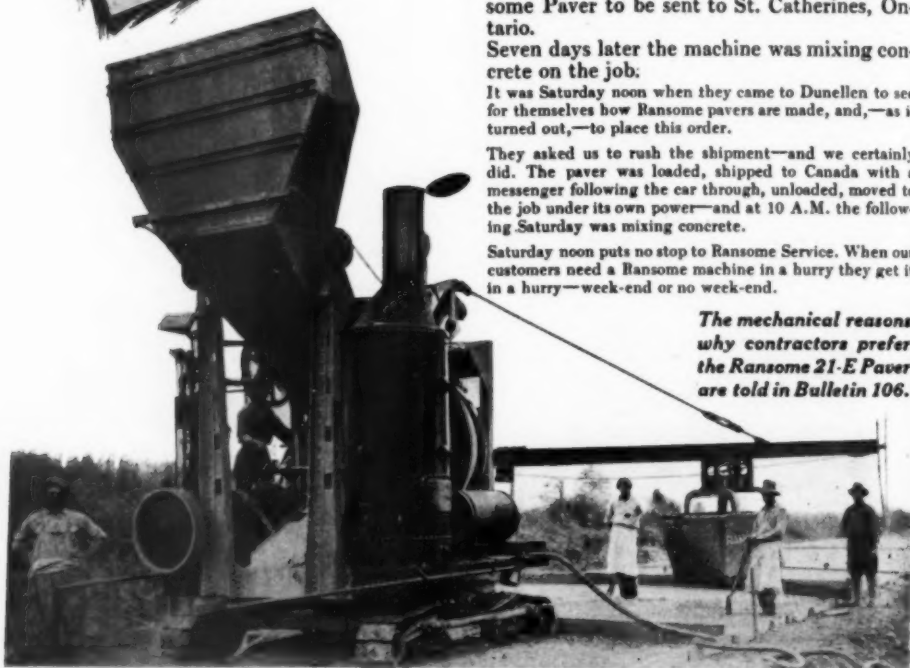
Seven days later the machine was mixing concrete on the job:

It was Saturday noon when they came to Dunellen to see for themselves how Ransome pavers are made, and,—as it turned out,—to place this order.

They asked us to rush the shipment—and we certainly did. The paver was loaded, shipped to Canada with a messenger following the car through, unloaded, moved to the job under its own power—and at 10 A.M. the following Saturday was mixing concrete.

Saturday noon puts no stop to Ransome Service. When our customers need a Ransome machine in a hurry they get it in a hurry—week-end or no week-end.

*The mechanical reasons  
why contractors prefer  
the Ransome 21-E Paver  
are told in Bulletin 106.*



## *Ransome* 21-E PAVER

RANSOME CONCRETE MACHINERY CO.

1772 Second Street, Dunellen, N. J.

Manufacturers of Mixers, Pavers, Pneumatic Mixers, Chuting Plants, Hoist Buckets, Bins, Cars, Carts, Etc



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# CONTRACTORS' & ENGINEERS' MONTHLY

A PURCHASING GUIDE FOR ENGINEERS, CONTRACTORS, PUBLIC OFFICIALS AND OTHER PURCHASERS  
 OF CONSTRUCTION MATERIALS AND EQUIPMENT

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Vol. III

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# 1897 - Autocar - 1921

Wherever there's a road

## Heavy Duty Autocars build California roads

**C**OLLINS & SEPPI,  
of Healdsburg, Cal.,  
like hundreds of highway  
contractors all over the  
country, are building  
better roads at new low-  
cost figures with Autocar  
motor trucks.



**The Heavy Duty Autocar eliminates waste**  
in gas consumption  
in oil consumption  
in time of goods in transit

**It is the economical motor truck**

*\$4350, 120-inch wheelbase chassis (weight 7,000 pounds)*

*\$4500, 156-inch wheelbase chassis (weight 7,150 pounds)*

*(F. O. B. Ardmore, Pa.)*

**The Autocar Company, Ardmore, Pa., Established 1897**

# Autocar

Wherever there's a road

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# Contractors' & Engineers' Monthly

Vol. III, No. 5

New York, N. Y.

November, 1921

## Cutting Labor Cost in Road Building

Carrying Dry Aggregates from Bins to Mixers or from Mixers to Grade by Special Trucks Reduces Cost of Construction and Increases Speed

THREE men to the wheelbarrow load, nine wheelbarrows in operation, a total of 27 men to feed one mixer—and that wasn't all the labor that was eliminated. For the stone, sand and cement must be hauled to convenient distances along the roadway. This means trucks or wagons and more men, also much waste of material. That was the condition under which Wing and Munger were laying a concrete road between East Avon and Coneyus Lake, N. Y., and they are examples of many others.

A 1½-ton truck, especially built and equipped for such work, showed them a saving possible through the elimination of most of the labor—to say nothing of the waste accompanying the dumping and reshoveling of aggregates along the road. The truck with two ¾-cubic-yard hoppers dumping independently to the rear by gravity received the proper quantity of sand and



LOUIS SILVESTER, HARTFORD, CONN., LOADS HIS TRUCK FROM AN OVERHEAD BIN

stone—one batch in each hopper. This was quickly carried to the mixer and dumped into the skip, where the cement was added. This eliminated 27 men, 9 wheelbarrows and 18 shovels; two heavy trucks were released for other work, saving twice handling sand and stone and the 7 per cent loss due to the rehandling.

The 27 men on this job were paid \$81 a day, which would amount to \$20,250 per year. On many jobs the laborers are higher-paid, and there are also the other savings mentioned above. The labor saving alone would pay for 7 trucks each year. A time study of the truck operations is interesting. The farthest end of the grade from the loading bin was exactly 3 miles. Over this haul the truck established the following average time, hauling dry concrete aggregate:



AN ELECTRIC SHOVEL PILES THE LOAD ON FRANK HIGH'S TRUCK IN CINCINNATI, OHIO



**THE STEAM SHOVEL PROPERLY OPERATED PUTS A BIG LOAD ON THIS TRUCK OF J. S. FERGUSON, CLEVELAND, OHIO, WITHOUT DAMAGE**

Loading 2 hoppers, including backing, etc. . . . 4 minutes  
 Running 3 miles on rough road. . . . . 11 minutes  
 Dumping 2 hoppers, including backing, etc. . . 2 minutes  
 Running 3 miles empty. . . . . 10 minutes

Total round-trip time average: . . . . . 27 minutes

On this long haul each truck can make two trips per hour hauling four batches. This makes 20 trips or 40 batches each day. Every half-mile under this 3 miles means a big difference in time.

At its very best, the road builders' year is a short one as far as productive work is concerned. The winter months stop operations, on many days rain prevents working, and time is often lost on account of shortage of materials or difficulty in preparing the road-bed, or because of labor troubles. The progressive road builder has learned that he must take advantage of every minute suitable for road work. This means the use of the most suitable machinery and equipment that will speed up the work.

Motor trucks have come to the front as efficient machinery for contractors and road



**WHEN IT COMES TO DUMPING, THE DUAL GRAVITY SIDE-DUMP BODY ON THE TRUCK OF THE BROAD BROOK COMPANY, BROAD BROOK, CONN., IS WORTH WHILE**

builders. Equipped with power dump bodies, controlled by hydraulic or mechanical hoists, and carrying from 1 to 5 cubic yards, motor trucks have enabled contractors to increase the efficiency of the working forces to a remarkable extent.

Last fall, for instance, T. P. Fitzgerald laid 12 miles of brick paving between Ashtabula and Conneaut, Ohio, in the record time of 92 days. Mr. Fitzgerald gave credit to his fleet of 14 motor trucks for this record.

Grover L. Peddicord, of Baltimore, operates his 3½-ton truck 40 miles a day, making five 8-mile trips on an average. He hauled 5,750 tons of building material in 230 days last year for a total cost of \$5,217.40. This includes all items of truck



**THE SILVER LANE SAND COMPANY, HARTFORD, CONN., FINDS THAT HAND LOADING PAYS UNDER SOME CIRCUMSTANCES**

expense, as well as \$2.64 per day office overhead, and gives an average of \$22.68 per day, or 91 cents per ton.

Working on the excavating job of the Baldwin Reservoir at Cleveland, J. S. Ferguson hauled from 2½ to 4½ cubic yards per day in his 3½-ton truck, the haul being up-hill over a rough road one way. He averaged twenty 3-mile trips per day at a cost of \$23.78, making the unit cost 27.9 per cubic yard.

A 5-ton truck owned by the Brick Cartage Company of Chicago delivers an average of 10,000 facing brick a day during the busy season, which lasts for about 8 months. On local work the trucks average about \$2.11 per 1,000 brick. On outside work, such as to Wilmette, 18 miles,

this is \$6.77 per thousand, a low figure considering quick delivery and distance.

According to Frank Sattler, of Pittsburgh, Pa., during a period of 630 days his 3½-ton truck carried 15,120 tons of gravel, sand and dirt for \$18.04 per day, or 75 cents per ton handled. During this time the truck traveled 25,200 miles.

Charles McCarron, building material

hauling contractor of Philadelphia, Pa., states that in three years his fleet of four trucks on their regular work made seven 9-mile trips per day, averaging 4 tons per trip. Even including \$2.30 per day for administrative overhead, the trucks finish such a day's work for \$22.58. This is a cost of but 63 cents per ton handled.

ACKNOWLEDGMENT.—Illustrations by courtesy of Selden Truck Corporation, Rochester, N. Y.

## Laborers Remove Forms

### Reinforced-Concrete Builders Strenuously Oppose Carpenters for This Work

THE following letter was received by the *Bulletin* of the Associated General Contractors, from Tylor Field, Vice-President and Treasurer of the Ferro Concrete Company of Cincinnati, Ohio, in response to a request for opinions regarding the question, "Who Shall Remove Forms?":

"Our principal business since 1903 has been the erection of reinforced concrete buildings. During this time we have, practically without exception, used laborers for the wrecking and removing of wooden con-

crete forms, and we feel confident that handy laborers, under a good foreman, can do this work much more cheaply than can carpenters. In some instances we have a carpenter act as foreman, but the work is done by the laborers and we would oppose most strenuously this work being given to carpenters. Their only possible claim, as we see it, is that it is handling wood, and this certainly would be poor grounds for such a claim. It is not, in our opinion, carpenter work in any way."

## A Factory-made Expansion Joint

A FACTORY-MADE expansion joint, consisting of a uniform body of pure asphalt compound, compressed under roller pressure between two layers of high grade wool felt saturated with asphalt and bonded together inseparably, is manufactured under the trade name "Elastite" by the Philip Carey Co., 9 Wayne, Ave., Lockland, Cincinnati, Ohio. The thickness of the strips of Elastite is determined by the amount of asphalt compound used in its manufacture and this is governed by the requirements of the installation for which the Elastite is to be used. No spacing strips are required with this expansion joint, as it is laid before the pavement is put down and becomes a permanent and integral part of the work with obvious economy. It may be used as a lateral or longitudinal joint in concrete, brick, wood-block, granite-block and other types of pavement, as a joint in sidewalks, around lamp-posts and between concrete curbs and walks.

Elastite expansion joint can be installed wherever good engineering practice indicates the need of provision to prevent buckling, cracking, or excessive pressure from the expansion of surface materials. In concrete wood block and granite streets, Elastite should be laid

longitudinally between the curb or gutter and along the car tracks, and transversely at intervals to absorb longitudinal stresses, due to expansion. In brick paving, it should be installed longitudinally next to the curb or gutter and along the car tracks. In cement sidewalk construction, the transverse installation should be made at predetermined intervals. Longitudinal installation should be provided between corner blocks and the curbing, to prevent buckling of the sidewalk and breaking of the curb by the pressure of the expansion.

After completing a paving job in which 30,000 lineal feet of Elastite were used, the paving contractor wrote to the manufacturers as follows:

"It is a very convenient method of putting in an expansion joint and I like it far better than the poured joint. I consider it somewhat cheaper in the long run, besides being much better in many other ways. The great advantage of Elastite is that it remains where it is placed, while the poured joint will run wherever it is possible for it to get. It is clean to handle and does away with the pitch kettle and pouring nuisance. I am strong for Elastite."

# Asbestos—A Marvel of the Ages

Not a Mere Article of Commerce, But a Servant of the People

**F**OR centuries asbestos was but a curiosity; to-day it is a recognized commercial necessity. Developed by the efforts and the resources of a great business institution, this curio of the ages now contributes to the world's progress by making life safer and more complete.

## What Asbestos Is

Asbestos is rock, as heavy and dense as marble, yet composed of silky fibers which can be carded, spun and woven as easily as wool, flax or silk. One of the most valuable properties of this mineral is its indestructibility under almost every condition of heat and moisture. Wood burns; asbestos is unchanged by flame or temperatures to 1,600 degrees F. Stone disintegrates; asbestos defies erosion. Steel rusts; asbestos is immune to climatic and atmospheric conditions.

Asbestos is most generally believed to be volcanic in origin. The deposits probably took shape during the prehistoric cooling of the earth's surface, and either water or steam probably broke apart the original rock formation and rebuilt it under pressure into its present fibrous state. In external appearance and chemical composition, different types of asbestos fiber are much alike. The difference between them is the difference between good and bad asbestos and will be perceived at once when the fibers are torn, twisted or bent between the fingers. Chrysotile, which is the fiber having the greatest commercial value, gives out long, silky threads which lend themselves to the spinning processes in the manufacture of this mineral into various products. Other forms

split up into harsh and sometimes brittle fibers which occasionally break when rubbed between the fingers.

## Where Asbestos Comes From

Though asbestos is found in some form or other in nearly every country in the world, it is never found precisely alike in two countries. It differs not only in appearance, but also in physical and chemical characteristics, according to the locality from which it comes. Some sections of the world yield asbestos which can be used for a surprising number of purposes, but in most sections the rock, because of its coarseness, or the ruggedness of its texture, is practically useless commercially.

In no other country has the mining of asbestos, and especially its preparation for the market, attained such proportions or success as in Canada. The excellent quality of the Canadian asbestos, the careful and clean separation of the fiber, and the richness and accessibility of the mines will enable Canada to lead in the production of asbestos for years to come.

The most important of other producing countries in point of quantity is Russia, but the Russian fiber is not nearly as silky as the Canadian. It is harsher and has a yellow-brownish hue. The chief drawbacks of the Russian asbestos industry are that the mines are remote and the mining season scarcely two months long. As no mechanical means are employed in the Russian mines, the work must be rushed by hand during the short season and cannot be done carefully or thoroughly.

Italy, the country in which asbestos was first



AN ASBESTOS MINE IN CANADA OWNED BY JOHNS-MANVILLE INC.

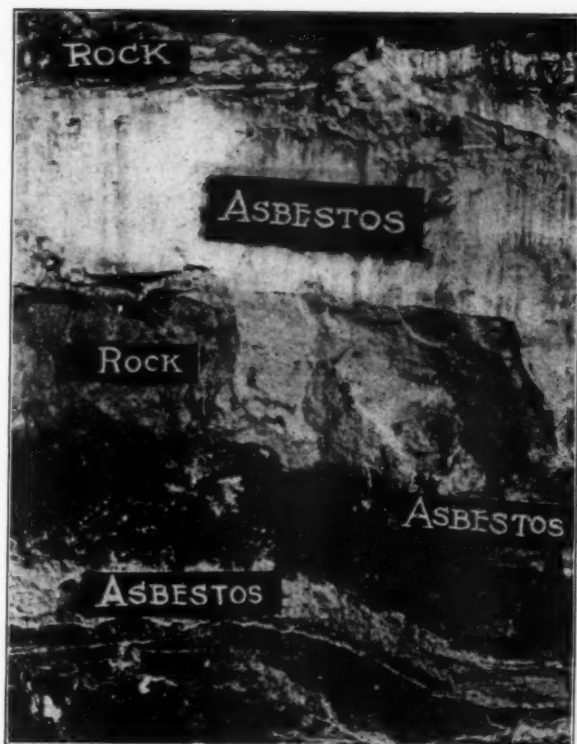
produced, yields a type of this mineral which is chemically about the same as Canadian asbestos, but its physical properties are quite different. Good long fiber is seldom found in Italian mines. Asbestos is also found in South Africa, Newfoundland, New Zealand, Queensland, South Australia, the United States, and many other parts of the world, but for one reason or another the asbestos mined in these countries does not adapt itself to commercial use so readily as Canadian asbestos.

#### The Growth of the Asbestos Industry

Though the properties of asbestos were known to the early scientists, it was not until about 1870 that the first experiments were made for using it on a commercial scale. At about the same time the first specimens of a very fine asbestos from Canada, with silk-like fibers, were exhibited in London. In 1878 mining operations were commenced on a small scale in Canada. A lot of 50 tons of selected crude asbestos was shipped to England, but great difficulty was encountered in selling it, as no regular demand for asbestos had been established. The uncertainty of the supply, the slight knowledge of how this material could be used, as well as its high price, due to the very crude and slow methods of mining, were responsible for this lack of interest.

The good quality of Canadian asbestos and the ease with which it could be spun and woven, however, attracted sufficient interest to induce some enterprising capitalists to investigate this Canadian asbestos further. The more these men investigated it, the more apparent became its possibilities, and busy mining camps soon sprang up around Black Lake and Thetford in Quebec. Hand labor, which was used in mining this rock and preparing it for manufacture, was then slow and clumsy, and as a result the cost of asbestos was high.

Experiments were begun to speed up the mining operations and bring down the cost of this mineral. Many experimental machines were installed, discarded and remodeled before satisfactory results were obtained. The difficulties to be overcome were many, as the aim was not only to replace hand labor with machines wherever possible, but also to separate the asbestos more thoroughly from the rock in which it was imbedded. After years of persistent effort these difficulties were overcome



CRUDE ASBESTOS IN ROCK FORMATION

and the present efficiency of asbestos mining and manufacture was attained.

Eighty-five per cent of the world's production of asbestos comes from two points in Canada, both in the province of Quebec, one known as the Thetford and Black Lake district, the other as the Danville district. The largest mine in the Danville district is that of Johns-Manville Inc., of New York City, which covers about 500 acres. The outcroppings of asbestos-bearing rock so far developed cover about 100 acres of this area, and the main pit or quarry on the property is 1,500 feet long, 600 feet wide, and 200 feet deep.

As practically the whole mass of rock has to be mined, the operations are carried on in open pits or quarries. Consequently, the expense is largely increased when severe storms of rain or snow prevent the carrying on of the work in these open pits. On account of the severe weather conditions in Canada, there is very little production from December to April. In order to produce 100 tons of fiber of various grades, it is necessary to quarry, blast, hoist, and put through the mills 2,000 tons of rock. To handle this quantity of rock requires 12 locomotives, 4 steam shovels, 20 miles of track,

22 derricks, 300 cars, and 3,000 horse-power to operate the mills, which represent an investment of almost two million dollars.

### How Asbestos is Mined

Asbestos mines are operated practically in the same way as large stone quarries, by a series of steps or benches, which enable the miners to dislodge large quantities of rock at each blast. The rock is so hard that it is necessary for it all to be drilled and blasted. Electricity and compressed air are used for operating the drills. The drill holes are usually put in from 8 to 20 feet deep. They are filled with dynamite and exploded by electric batteries, the blasts being set off at noon and at night when the men leave work. After the blasting, a number of men known as "cobbers" go into the pits. They pick out the rock having asbestos veins of one-half inch or more, which they can easily dislodge from the rock with small hammers. This material is taken to a cobbing room, where it is cleaned and sorted into three grades.

The rest of the rock in the pits is either loaded into the cars by means of steam shovels, or hoisted from the deepest part of the pits in buckets to the surface, and from there conveyed to the mills, about a quarter of a mile from the pits. There the rock is dumped into large bins, and from these bins into very large crushers, which reduce it to pieces the size of a man's fist. These pieces are conveyed to rotary dryers, and then into cyclones, which crush, not grind, it into very small particles.

The crushed rock containing the asbestos fibers is taken by conveyors and passed over shaking-screens 6 feet wide and 12 feet long. As the fiber is much lighter than the rock, it comes to the surface when the screens are oscillated, and is lifted from the screens by air suction into large revolving cylinders known as graders. The graders separate the fiber into three different grades: one called long spinning fiber, which is used in the manufacture of various textiles; a medium grade, which is used for making asbestos felts for roofing and fire felt for sheets for insulating purposes; and the third, or short, grade, used for the manufacture of millboard, cements, etc. The fiber is packed and shipped in bags of 100 pounds each.

### The Use of the Fibers in Manufacture

The asbestos used in most products is shipped to the factories from the mines in four grades: crude Nos. 1 and 2; selected fiber, asbestos fiber medium grade; and asbestos fiber short grade. The crude asbestos, which is used in the manufacture of textiles, is first run through heavy rollers, which crush the rock without destroying the fiber. The partially broken-up mineral then passes through separating machines, which automatically remove every particle of rock from the crushed mass of asbestos, leaving the fiber clean and ready for the next operation. Other machines then open up or crush it into a fine mass. It is then ready for the dusting machine, which blows the fiber about and auto-

matically takes out all of the fine dust and any remaining short fibers. The resultant product is a long, clean fiber ready for spinning.

The carding machine automatically weighs out the exact amount of fiber per minute, at the same time placing it on a traveling apron which feeds the machine automatically at a certain prescribed rate per minute. The machine takes the fiber, straightens it out, and feeds it through another part of the machine, which twists the fibers into strands of fine yarn of uniform quality.

The yarn is taken to the twisting machines, which are regulated to make an exact number of twists per inch, according to the use to which the yarns are to be put. While the twisting operation is going on, the yarn is wound on spools. If it is to be used in the manufacture of cloth, it is first placed on a doubling machine, where hundreds of strands of yarn are wound upon large drums, constituting the warps for the looms. Individual yarns are wound upon shuttles and go to make up the woof thread of cloth. In the case of yarns to be used for packings, brake linings, wire cloths, etc., the same machines twist a number of strands of fine copper or brass wire into the yarn.

Asbestos fiber of spinning length is also used in the manufacture of high-grade insulating cements and asbestos paper. Another grade of asbestos fiber is especially selected and prepared at the mines, for use in the manufacture of asbestos roofing felt. The finished asbestos felt is put through large vats, where it is thoroughly impregnated with a waterproofing compound. It is then taken to the roofing machines and laminated. Another important use of this selected fiber is in the manufacture of 85 per cent. magnesia pipe covering and blocks. For these it is thoroughly mixed with pure carbonate of magnesia, molded into the desired shapes and dried.

The grade of asbestos fiber known as medium is used in the manufacture of asbestos paper, millboard and air cell coverings. In the manufacture of asbestos paper, practically the same method is used as in making any other kind of paper. Medium-grade mill fiber is also used in asbestos wood and asbestos shingles. For these products the fiber is mixed with Portland cement under pressure, then saturated with water and pressed in powerful hydraulic presses into the various shapes and thicknesses desired. It is allowed to season for several weeks in order that the cement may be fully set and cured before the products leave the factory.

The short asbestos fiber is used principally in the manufacture of the cheaper grades of cement felting, where certain portions of clay and fiber are automatically fed from the mixing machines into hoppers and are weighed and packed in bags ready for shipment.

### The People's Servant

Consider what asbestos products do: not their mere mechanical function, but the countless ways in which they contribute to the daily existence of millions of people; the thousands of

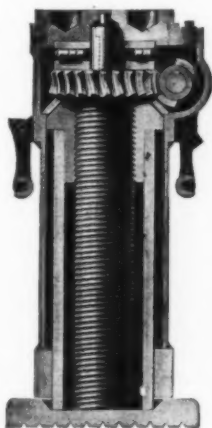


ASBESTOS SHINGLES USED ON THE OFFICE OF DWIGHT JAMES BAUM, ARCHITECT, RIVERDALE, N. Y.

plants in which the safety of the workers, production itself, in fact, the very continuance of the business, depends upon the unfailing, satisfactory performance of a product of asbestos. Take asbestos roofings and shingles, for instance. The great benefits of community life bring, with the closer proximity of buildings, a serious fire hazard. But asbestos has lessened that danger and so is an important factor in making communities possible.

Producing a fabric that is flame-proof and acid-resisting is truly a triumph of asbestos converting. But the greater thing in asbestos cloth is its power to protect the workman from hot metal and broken carboys; to save him suffering from burns; to save even his life from accident or the carelessness of others.

Asbestos is more than an article of commerce—it is a servant of the people, to their comfort, profit and safety.



### A Light-Weight, High-Capacity Lifting Jack

**A** JACK which is of comparatively light-weight construction for its capacity, and which weighs considerably less than other jacks of equal power, in some sizes less than half as much, is on the market under the name of the "Doughboy" and is made by the McKiernan-Terry Drill Company, 19 Park Row, New York City. The photograph shows an X-ray of the inside of this jack, illustrating its method of construction. The toe of the jack can lift fully half as much as can be carried on its head. The construction is such that it cannot turn around, no matter what kind of job it is used on, and it cannot back down until released. This jack is made in sizes from 15 to 100 tons, is easy to operate, and a 24-inch handle provides ample leverage for operating. It has a positive check on the head to prevent damage from over-extension. It is built of steel throughout.

### Who Makes Water Proofing Compounds?

Frequently you are confronted with the question of who makes a specific kind of equipment. By consulting the "Where to Purchase" directory beginning on page 3 of the CONTRACTORS' AND ENGINEERS' MONTHLY your query is quickly answered.

## Digging Thirty-Six Miles of Sewer Trench

C. R. Nichols, of Wichita Falls, Tex., Has Recently Finished a Large Contract for That City, Using Four Trench Excavators

**T**HIRTY-SIX miles of sewer excavation for various sizes of sewer mains from 6 inches up to 39 inches means a big job, one that requires for its successful completion up-to-date machinery and methods and first-class management.

This is the size of the job recently completed for the city of Wichita Falls, Tex., by C. R. Nichols, a prominent contractor of that city. The contract price was \$750,000, calling for 36 miles of sewer trench with a maximum depth of 22 feet. This is the most extensive sewer work ever undertaken by the city of Wichita Falls, and the largest single contract let in the Southwest.

Mr. Nichols is well equipped to handle a job of this size, as he has been in the contracting business for over eleven years, and has specialized in sewer, water-works and paving jobs.

### What the Job Includes

The trench for the main trunk line of the sewer is 7 to 22 feet deep, 5 feet wide. The sewer itself is 39 inches in diameter, built up of vitrified segment blocks. Two diversions intercept the main trunk line, to relieve the main part of town from congestion, and 6-inch lines run from the main trunk lines through alleys. There are nine sizes of sewer mains, from 39-inch main trunk lines to 6-inch laterals, and, as stated above, the total length of sewers built was over 36 miles. The contract includes building the entire length of sewer mains as well as the excavation and backfilling.

### How the Excavation Is Handled

The excavation for this contract was done by four trench excavators, a Bucyrus Class-72 doing the heaviest work, the remainder being done by two Buckeye trench excavators and one Austin excavator. These machines excavated the different parts of the job as follows:

Trench for 39-inch main,	6,800 feet—Bucyrus
Trench for 36-inch main,	6,000 feet—Bucyrus
Trench for 33-inch main,	4,000 feet—Bucyrus
Trench for 30-inch main,	4,000 feet—Bucyrus
Trench for 24-inch main,	8,000 feet—Buckeye

Trench for 18-inch main,	11,000 feet—Austin
Trench for 15-inch main,	14,000 feet—Buckeye
Trench for 12-inch main,	7,600 feet—Buckeye
Trench, smaller mains,	100,000 feet—Buckeye

The material is for the most part hard red clay with some quicksand. Some very good outputs have been made on this work. During the period from November 23, 1920, to February 14, 1921, the total excavation amounted to 19,581 cubic yards. The total machine cost for this excavation, exclusive of repairs and depreciations, was \$3,719.90, including labor and fuel costs. This low cost per cubic yard shows how efficiently the job was handled.

All sections of the trench over 10 feet in depth were braced with 2 x 12 pine planks. The walling strips were spaced on 5-foot centers.

The center of the spoil pile was 12 to 18 feet from the edge of the trench. Three Austin backfillers, one Buckeye backfiller, one Cletrac tractor, and one Holt tractor were used for backfilling.

### Building the Segment Block Sewer

The segment tile of the sewer main was laid behind the trench excavator as fast as the trench was dug. The method of building the sewer is interesting. The trench was first rounded out to fit the side of the finished pipe. One row of segment blocks was then laid in the center of the ditch and tamped to grade. This is known as the flow block. A row of blocks was then laid on each side and tamped to their proper places. Other rows of blocks were then laid till the sewer was completed to the spring line. The blocks for the upper half of the sewer were laid on a form 12 feet long. As soon as the arch was completed, the form was collapsed and moved ahead for another section.

Mr. Nichols has owned eight trench excavators of different makes during the time he has been in the contracting business, and has operated under lease or rental twelve machines. In regard to the Bucyrus trench excavator, Mr. Nichols says: "I am exceedingly well pleased with the work performed by the Bucyrus and think it the best

machine I have ever operated for heavy work."

The speed of operation of this machine, as timed on the Wichita Falls job, is 61½ feet of completed trench, 5 feet wide by 21 feet deep, in 60 minutes of continuous operation. This Bucyrus trench excavator has made an output of 333 cubic yards per hour, digging in hard clay.

The Bucyrus trench excavator is equipped with an independent conveyor engine. This makes it possible for the operator to regulate the distance from the trench to the center of the spoil pile. Mr. Nichols states that this is the biggest improvement he has

found on a trench excavator in years, as it allows the spoil to be kept far enough away from the trench to prevent caving.

This machine is equipped with a 20-foot ladder which will carry buckets from 24 to 72 inches wide. However, none smaller than 48 inches were used on this job.

From 50 to 150 men were employed at different times on this job. C. R. Nichols was directly in charge, assisted by R. C. Nelson, chief engineer; Clyde C. Key, office engineer; W. A. McRae, superintendent; and Tony Anderson, George Lewis, T. R. Lester and W. E. Mayer, foremen.

ACKNOWLEDGMENT.—Courtesy of *The Excavating Engineer*.

## Estimating—A Specialty

Public Quantity Surveys Advocated

By Arthur Priddle

Quantity Surveyor, San Francisco

THIS subject is getting to have something of interest for architects, contractors and owners—judging from the fact that there has been considerable attention given to it during the past few months.

The Scotch "guess an be ——" system still obtains in most places and with many contractors throughout the land, and it takes "brave men with their eyes shut" to take chances that are taken with the present system—if system it can be called.

The man commonly called the quantity surveyor and estimator—one or either or both—is a specialist; he is not the contractor, nor is the contractor the quantity surveyor and estimator—he has other business activities. Neither is he the architect-engineer, for the same reason. The quantity surveyor and estimator is a specialist in his line.

The quantity surveyor devotes his time to a critical and analytical examination of plans and details and the explanatory specifications or bill of particulars (or bill of purchase and sales, as it should be called), with the sole object of listing the requirements for the work; for the purpose of giving the contractor a correct basis for mak-

ing up his bid. He actually does what the boy does who tears the bit of machinery to pieces to "see the wheels go round." He finds out and lists how much and what it is made of, according to the specifications.

The quantity surveyor and estimator is the best judge of the value of a piece of work on account of his close touch with the labor and material markets and the general elements of the contracting business.

The quantity surveyor and estimator is the best judge of the cost of doing a piece of work from the present plans, on account of his varied experience in handling projects of many kinds. If he is a practical, experienced man in the business, without doubt his services should be used in connection with any important project and, incidentally, all projects are of some importance in that they involve the expenditure of money for labor and materials, placed in certain positions.

One thing is certain—there is only one quantity in a building—excavating, concrete, brick, steel, lumber, plaster, etc.—and if the describing and delineating documents are as precise and clear as they should be, the quantity surveyor can tell what that quantity is to a nicety.—*A. G. C. Bulletin*.

## A Portable Pumping Unit for Unwatering Trenches, Excavations and Flooded Areas

**T**O fill the need for a lightweight portable centrifugal pump with an integral power unit for unwatering trenches, catch-basins, flooded areas, excavations, pits, boats, skating-rinks, caissons, etc., the Evinrude Motor Company, Milwaukee, Wis., has placed on the market the Evinrude unit centrifugal pump. This equipment is so light that it can be handled easily by one or two men, and yet is capable of draining a considerable area or unwatering excavations with surprising rapidity.

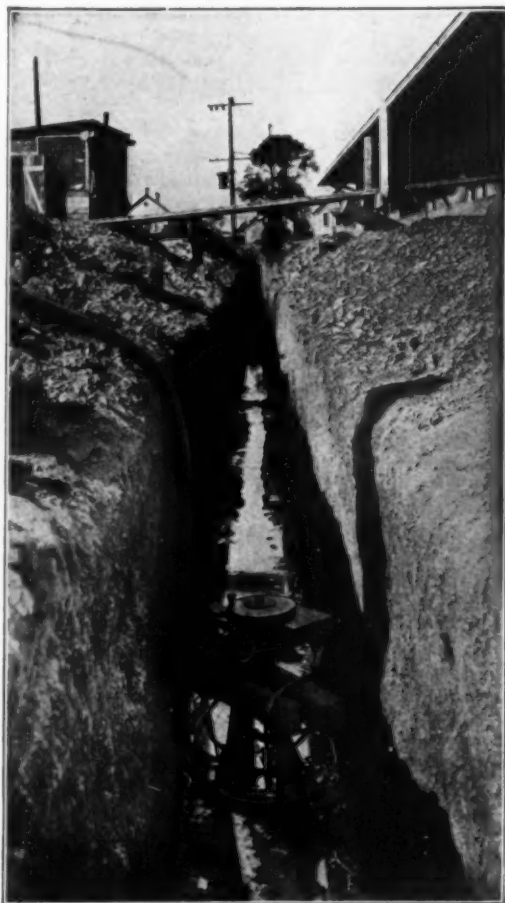
In pumping, water conditions vary greatly, particularly in the contracting field. Low cost and speed are almost without exception desirable. When the work requires a small equipment and when the need for a pump arises unexpectedly, the contractor naturally seeks one with a unit power-plant which can be readily moved and installed with practically no installation charges. The Evinrude centrifugal is not claimed to be a solution for every conceivable pumping problem, but is offered where portability, high capacity and low cost are the essentials.

This pumping unit has but one moving part, the impeller rotating at high speed. This gives motion to the liquid, which the large, unobstructed passages of the pump, free from valves, levers and sliding parts, allow to flow in large quantities. It is very easy to pump thick, gritty liquids containing a high percentage of solids.

The equipment consists of two parts, namely, the pump proper, and the motor. The two parts are made as a unit complete in itself, and the pump is directly driven by the well-known Evinrude motor. There are no gears, belts or chains; thus lost power is reduced and the greatest possible amount of energy is generated in the pump.

When practicable in using this pump, it should be set right down into the excavation or the reservoir and the pump submerged in the liquid. The pump is light enough, weighing only 115 pounds, so that this can readily be done by one or two men. When this is done, no suction pipe is required, and there is no need of priming. Furthermore, the pump need not even be fastened down if its use is not to be permanent.

If it is impossible to put the pump in the liquid, a hose or pipe for a suction, up to 20 feet, can be readily applied. The motor is



**TRENCH PUMPING IS MADE EASY WITH THIS  
COMPACT UNIT**

started with a half-turn of the fly-wheel, and the pump starts the water through the discharge pipe. The 2-horse-power size delivers 4,200 gallons per hour at a 25-foot head. If the user of one of these pumps wishes to make a permanent installation, it can be set readily in a floor space 16½ by 23 inches. The lugs for bolting the pumps down are furnished with each unit.

Contractors have found this pump particularly useful when it is to be placed in a narrow ditch or hole, as it can be started at the ground level and then lowered or slid down to the liquid by means of a rope or ladder.

# Concrete Highway Bridge and Culvert Standards—Part II

State Culvert and Highway Standards Tabulated and Discussed

By A. C. Irwin

## Plain Concrete Arch Culverts

THE use of plain concrete arch culverts is not nearly so prevalent as the use of reinforced-concrete slab or girder bridges having the same span. The question arises, however, as to whether this type of culvert has been given the consideration it deserves. It is true, of course, that the plain concrete arch culvert, including the abutments, requires considerably more concrete to construct than does the reinforced concrete slab or girder type. On the other hand, the former requires no reinforcing rods with the attendant cost of placing them. There is another consideration which bears upon the increasingly important matter of the excess strength for which a highway bridge should be designed. It may be idle to try to predict the increases that will take place in the loads which future highway bridges will be called upon to carry. Some students of this question believe that these increases will be equal in percentage to those that have taken place on our railroads. The very fact that a plain concrete arch is not susceptible to the accurate computation of stresses permitted in the design of the reinforced concrete slab or girder types results in the use of a very high factor of safety, which may be found exceedingly valuable to take care of large future increases in live loads.

Three types of footings are found for plain arch culverts. For small spans up to

5 feet the state of Illinois uses the bottom slab, which supports the arch without special footings. The Illinois standard also preserves a constant thickness of the arch ring and is really but a modification of the pipe culvert. The designs of all other states examined show an increase in arch ring thickness from the crown toward the springing lines. A crown thickness of 6 inches seems to be the minimum for all states except Pennsylvania, which requires an 8-inch minimum crown thickness.

In general, the standard plans do not call for waterproofing arch culverts, and weep holes are provided in those of only one state. In this connection it would seem a proper practice to carry the impervious roadway surface to gutters which would conduct the water entirely away from the space behind the abutment wings; and if U-abutments are used, the entire ground surface between ends of wings should be paved with impervious material. This would insure that no water would collect and be held in the earth fill under the roadway surface to soften the road foundation.

Construction joints are found commonly at the spring line and in some cases at the top of footing. Approximately 65 per cent of the plans examined make no provision for minimum fill above the arch ring. Either this point is left to be taken care of in specifications, or the importance of such a fill between top of arch ring and bottom

DATA ON ARCH CULVERTS

State	Span	Crown Thickness	Thickness at Spring Line	Loading	Footing	Type Wing-Wall	Location of Construction	Minimum Depth of Fill
Illinois.....	3' to 3'	6"	6"	*	{Bottom Slab}	U	None	.....
Missouri.....	2' to 6'	6"	Variable	{15-ton truck}	{Bot. Slab to 3' span 3' footings spans 7'}	{45°}	{Sp. line and top of footing}	2' 0"
Pennsylvania.....	4' to 12'	8" to 11"	Variable	*	Variable	45°	{Top of footing}	1' 0"
Virginia.....	3' to 14'	6" to 12"	Variable	*	{Bottom of side walls}	30°	{Spring line}	
Oklahoma.....	2' to 14'	6" to 12"	Variable	*	{Bottom of side walls}	{30° up. st. straight down st.}	{Spring line}	....

\* Loading not shown on plans.

of roadway surface is not considered important.

Flaring-wing abutments are the most popular type, but by comparing the cubic yards in U-abutments and in wing abutments it is seen that the straight-wing type is most economical of material for pipe culverts, and this doubtless holds true for plain arch abutments.

#### Girder Spans

A comparison of the tables for slab spans and for girder spans indicates that spans of about 20 or 25 feet are found to be more economical in the girder type than in the slab type. The state of Illinois has standard plans for girder spans of 65 feet, with the states of Wyoming and Colorado second with 50 feet. It may be worth while in passing to mention the fact that the 142-foot span recently constructed in California is claimed to have cost considerably less than arches would have cost.

Camber is given to girder spans in only three cases and in two of these this amounts to 3 inches. The writer cannot see where anything is gained by building concrete bridges with camber.

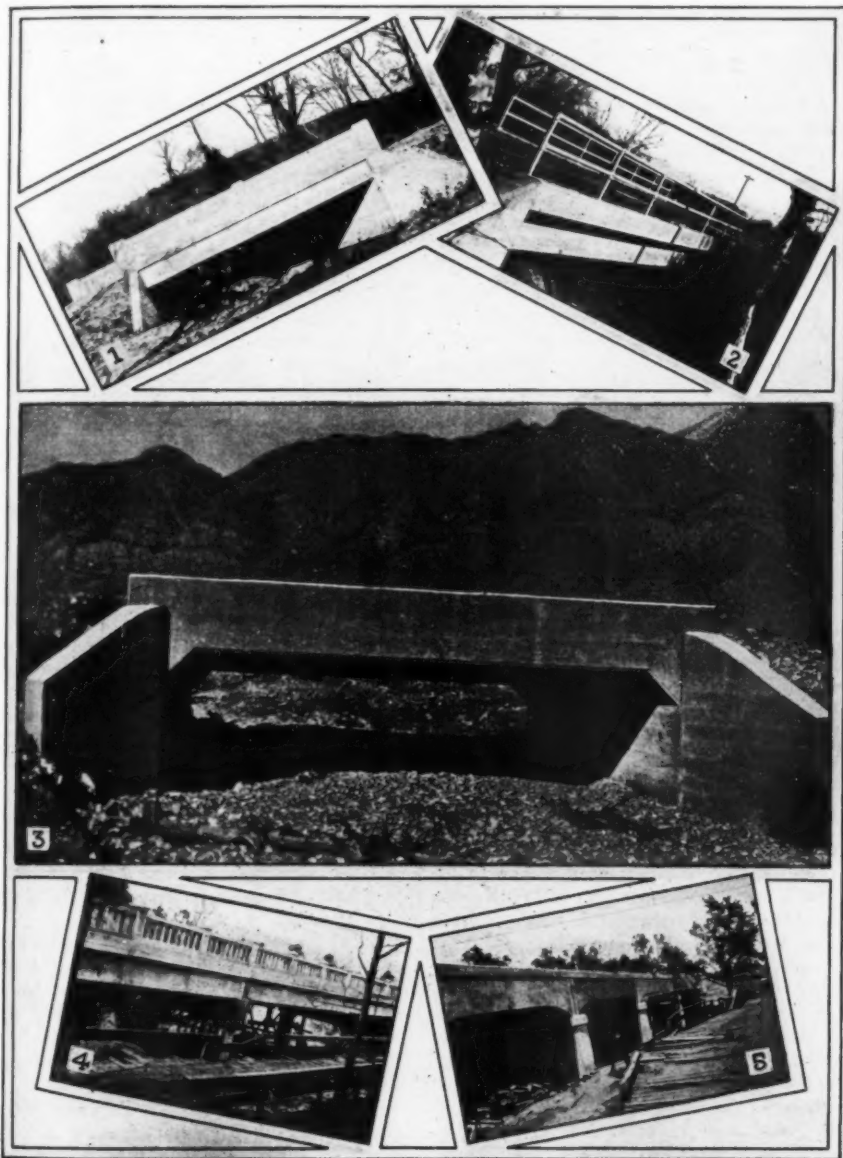
In contrast to the usual practice for slab spans, expansion joints are generally provided for the concrete girder type. For the long girder spans the Illinois standard plans provide a rocker under each girder between top and bottom steel plates to spread the end reaction over sufficient area of concrete to carry the load. However, the majority of expansion joints consist of three or four thicknesses of tar paper laid on the smoothly troweled surface of the bridge seat.

The table of girder spans shows the design loadings used by the various states and the width of roadway provided. This, of course, should agree substantially with the loadings and width of roadway required for slab spans, with the exception that for the long girder spans it would seem proper to increase the moving load over that for the shorter slab spans.

Four of the plans examined indicate the surface finish required. Two of them call for bush-hammered and two of them require rubbing. Bush-hammering is required only where the railings are paneled. While many state highway departments undoubtedly have specifications in regard to

DATA ON GIRDER SPANS

State	Span		Loading	Roadway	Type	Number of Girders
	Min.	Max.				
Alabama.....	20'	40'	15-ton truck, 30% impact and 80 lbs. per sq. ft.	18'	Deck	4
Colorado.....	16'	50'		20'	Deck	6
Delaware.....	35'	—	20-ton truck and 150 lbs. per sq. ft.	26'	Deck	6
Georgia.....	10'	38'	15-ton truck, 30% impact	18'	Deck	4
Idaho.....	25'	..	20-ton engine, 25% impact	..	Deck	4
Illinois.....	30'	65'		16' to 20'	Thru	2
Indiana.....	20'	..		20'	Deck	5
Maryland.....	18'	32'	18-ton truck, 15% impact	24'	Deck	5
Mississippi.....	16'	40'	15-ton truck, 30% impact, 80 lbs. per sq. ft.	16'	Deck	4
Missouri.....	20'	48'	15-ton tractor, 10-ton trailer, 20% impact	18'	{ Deck 20' to 40' Thru 30' to 48'	7 Deck 2 Thru
New Mexico.....	20'	40'		16'	Deck	3
North Carolina.....		25'	15-ton truck, 30% impact	18'	Deck	3
Ohio.....	{ 26' 35' 25'	{ 26' 35' 35'	15-ton truck, 30% impact	18'	Thru	2
Oklahoma.....	28'	40'	15-ton truck, 30% impact and 80 lbs. per sq. ft.	26'	Deck	6
Pennsylvania.....	20'	36'		24'	Deck	9
South Carolina.....	20'	32'	15-ton truck, 20% impact and 150 lbs. per sq. ft.	18'	Deck	4
Vermont.....	16'	30'	15-ton truck	18' to 21'	Deck	5
Virginia.....	20'	40'		18'	Thru	2
Wisconsin.....	20'	45'		18' and 20'	1/2 Thru	{ 2 Deck 2 Thru
Wyoming.....	30'	50'		18'	Deck	5



**TYPICAL CONCRETE GIRDER AND FLAT SLAB CULVERTS ON AMERICAN HIGHWAYS**

1. Small culvert on Route 1, Pennsylvania. 2. Girder type bridge in New Mexico. 3. A 16-foot slab bridge on Lost River Highway, Idaho. 4. Triple 40-foot T-beam girder bridge in Alabama. 5. Hard Labor Creek bridge, McCormick County, South Carolina, where forms were being removed

surface finish, which may be made to apply as required by the location of the bridge, it seems that the appearance of a bridge that would be used on a main line of traffic should be pleasing and that a proper place to indicate the finish would be on the standard plans. Difference in practice is indicated in regard to casting the hand-rail monolithic with the supporting girder.

The thickness of floor varies from a minimum of about 7 inches, depending upon the number of girders used, to a thickness of 16 inches required in the Illinois twin-girder design for the 65-foot span. Lack of agreement as to proper unit working stresses and load distribution is responsible for considerable variation in the quantity of material required by various designs for the same span and loading.

#### Design Loading

Of paramount importance at this time is the question of loading for which a highway ridge shall be designed. An examination of the tables of data on slab spans and on girder spans shows that the minimum load is a 15-ton truck with 30 per cent impact, and a maximum moving load of 20 tons with 25 per cent impact. In some cases the specified uniform load governs the design of the longer spans, but the alternate uniform loadings given for slab spans have no significance.

The moving load is usually distributed about 70 per cent on the rear axle of a 10-foot wheel base. A truck carrying a 10-ton load will itself weigh 6 or 7 tons, making a total of more than the minimum used in a majority of the standards.

If highway traffic loads continue to increase, many bridges will be carrying much more than their design loads and may have to be replaced with stronger bridges. It is a well-known fact that first class concrete grows stronger with age and that low working stresses are used in design, but there is a limit to the reserve strength thus provided, especially in the steel reinforcement, and if the prediction made by many about increases in rolling loads comes true, this limit will soon be surpassed. Laws limiting the loading of bridges are difficult to enforce and are questionable as to advisability. The extra cost of making highway bridges strong enough to carry much heavier than their present design loads would be a very small percentage of

the cost of the road itself. The value of the road may be increased much more than the small extra cost of stronger bridges, and it seems that a material increase in design loadings by a majority of the states would be advisable.

Along with the actual load specified, the matter of impact allowance is important. In view of the exhaustive experiments performed by the American Railway Engineering Association, it is hard to believe that there can be much impact on a bridge if the roadway is smooth.

Highway bridges are not subjected to the unbalanced rotating and reciprocating parts which in locomotives are the source of the major portion of impact on the main supporting members of railroad bridges. If the roadway is perfectly smooth, the effect of high speed is negligible. However, holes, ruts, loose stones, etc., which produce shocks on a bridge, may produce sensible impact effects, but the shocks will in large part be absorbed by the road surface and the mass of the bridge as a whole.

It would seem, therefore, that the usual addition to live load to take care of impact is ample and that in reality the allowance for impact increases the factor of safety and provides reserve strength for future increases in loading. It follows also that when the loads to which a bridge is subjected begin to approximate the maximum carrying capacity, the road surface should be maintained in a smooth condition.

#### Width of Roadway

Examination of the tables of slab and girder spans indicates a minimum specified width of roadway of 16 feet, but the majority of standards require a width of 18 feet or more.

W. G. Thompson, formerly Highway Engineer of New Jersey, recommends a minimum width of roadway of 20 feet and bases his recommendation on experience and observation of conditions in the Middle and North Atlantic States. There is no question but that the width of roadway on a bridge should at least equal the width of the paved roadway proper, and there is very good reason for making the roadway on the bridge equal to the paved width of the road plus the width of the shoulders.

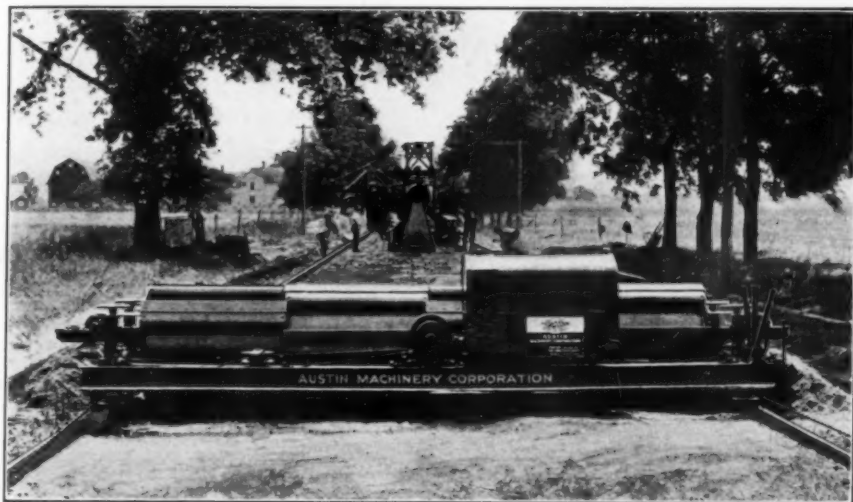
ACKNOWLEDGMENT—Printed by permission from the forthcoming copyrighted proceedings of the American Concrete Institute, Vol. 17.

## A New Labor-saving Sub-Grader

Providing a Uniform Surface for Foundation Saves Concrete

**W**ITH five billion dollars already appropriated for highway construction in the United States during the next ten years, road engineers and contractors are looking into every means which will assist in the efficient building of enduring concrete highways. As an additional step in meeting this demand, the Austin Machinery Corporation, Railway Exchange Building, Chicago, Ill., has placed on the market a new sub-grader, designed primarily to effect a labor-saving in finishing the road after it is rolled prior to putting on the concrete. In addition to reducing the number of laborers necessary on the job, the mechanically true grade means a substantial saving in concrete.

This sub-grader, illustrated herewith, is a one-man machine, gasoline-operated, and is driven along the side forms by means of cables. The 4-foot digging buckets, equipped with removable steel plow lips, are set to drive in five distinct places to varying depths up to 4 inches. In trimming the road, two plows shave off the sides between the forms and the buckets. The buckets then trim the road, depositing the excavated material on the 15-inch conveyor belt, which discharges the surplus material outside the forms. One passage over the road leaves the subgrade in condition ready for the laying of the concrete, thus saving both time and concrete.



A SUB-GRADER READY TO PREPARE SOIL FOR FOUNDATION OF CONCRETE ROAD

## Asphalt for Surfacing Concrete

The Value of Waterproofing as a Protection

**B**UILT with the best grade Portland cement, and rigidly supervised through every stage of operation, the big Grain Exchange in Winnipeg, Canada, was so constructed that it was expected to last indefinitely without further engineering attention.

In 1918 cracks developed throughout the structure, showing conclusively that the building was settling. An examination was made immediately by well-known engineers, and one footing was unearthed. Much to the amazement of the engineers, the condition of this footing was found to be extremely spongy. In other words, it was in such a state of decay

that the surface of the concrete could be punctured merely by the pressure of a finger.

Chemists were called in, and the Canadian Government and the Bureau of Standards in Washington also started investigations to determine the cause of the failure of the footing.

By chemical analysis of the ground water it was found that the concrete had been attacked by a strong alkali. Further tests proved that Portland cement concrete exposed to the action of such conditions was disrupted by internal explosion.

To offset the effect of this alkali the Vulcan Asphalt and Supply Company encased each

footing under the Grain Exchange Building in a water-proof bag, made of plies of cloth and Genasco Positive Seal asphalt, made by the Barber Asphalt Paving Company, Philadelphia, Pa.

This work was done in 1918, and since the footings have been thus protected against the alkaline soil condition no further cracking or settling of the building has occurred.

Genasco Positive Seal asphalt has successfully arrested the deteriorating effect of the alkali on the concrete.

This unusual soil condition is found also in many arid sections of the United States, and is receiving a great deal of attention not only from the Governments of Canada and the

United States, but also from leading chemists and engineers in both countries.

It has been estimated that the life of the average concrete construction exposed to this alkaline condition is about seven years.

With this appalling situation facing many building projects that have cost, in some cases, many millions of dollars, no stone should be left unturned to thoroughly protect any concrete construction that may be exposed to such soil conditions.

It has been decided by chemists that the Portland cement concrete exposed to these severe elements must be protected by some form of bituminous coating to prevent disintegration and possible failure.

## Portable Conveyors Supplant Hand Labor in India

THE Tata Construction Company, Ltd., Bombay, India, has been using two Haiss portable belt conveyors for over a year for unloading sand and brick from barges at the railway cars which stand alongside the slip, and also for loading sand from ground storage into bullock carts. The portable belt conveyors were equipped with a receiving hopper that would eliminate the necessity of placing the brick carefully on the belt, and they were thrown on the tail end, where they could be conveyed into cars.

These machines are operated by 5-horse-power kerosene engines with very good results. Assuming that the native labor in India receives one-tenth of the wages that similar labor receives in this country, and taking into consideration the fact that conveying machinery is a money-saver and labor-aid under these condi-

tions, it can be readily seen how much more of a saving can be made in this country by using labor-saving devices as compared to hand methods.

The conveyors are 25 feet long, equipped with 14-inch-wide, 4-ply Goodyear rubber belts and having a rated capacity of approximately one yard a minute. They are mounted on two wheels which are equipped with roller bearings, making it very easy for two men to move the belt to different parts of the yard. Simplicity in construction and operation must be the keynote of any machine used in Asia, and the fact that this particular machine has been used with considerable success speaks well for its dependability. The Tata Construction Company is the constructing unit of the Tata Iron and Steel Company, which controls probably the largest steel works in India.



USING A PORTABLE CONVEYOR IN INDIA TO HANDLE BRICK

## A New Form of Concrete

By Roger Ward Shotwell

THE word "concrete" generally suggests to the average mind, both lay and technical, something solid, hard, heavy and strong. Porosity and concrete are terms seldom if ever associated with each other. "Porete," a newly developed building material, is *porous concrete*. Its uses can best be illustrated in the history of the construction of the factory where it is made.

The factory building is 50 by 100 by 20 feet high, with side walls, roof, curing rooms, office partitions and fire doors all made of Porete slabs. After pouring the footings and foundation, the steel work was erected, and a wall 12 inches thick by 48 inches high was constructed, openings being allowed for doorways.

Tests made of roof slabs taken direct from the final step of manufacture showed sufficient strength to carry the weight of men laying them. An average uniform load of more than 170 pounds per square foot was required to break these unseasoned slabs. Accordingly, they were applied at once, and in a few days the roof was in place. The slabs were held in position on the purlins by means of heavy galvanized steel clips. One of the illustrations shows very clearly the channel iron purlins and the method of laying the slabs.

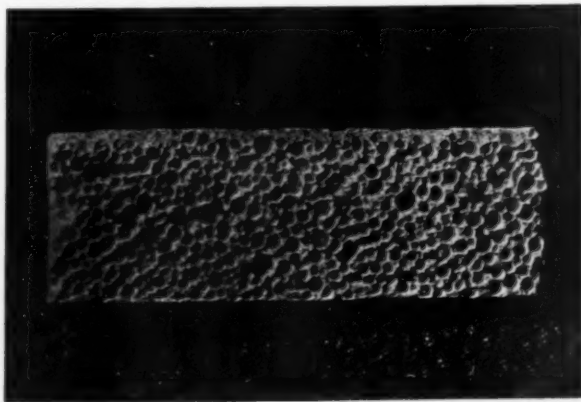
With the slabs all in place, a cement grout,



PLACING A SLAB IN POSITION. IT IS LIGHT ENOUGH TO BE EASILY HANDLED BY ONE MAN

of one part cement to two and one-half parts sand, was floated over the entire surface. These slabs covered with 1/16- to 1/8-inch of grout attained a carrying capacity far exceeding 250 pounds per square foot, thus complying with the specified building department requirements for a live load of 40 to 50 pounds with a factor of safety of more than 5. Porete slabs are smooth on one side and thoroughly porous on the other. Beveled edges on the slabs formed a V-shape groove, which added greatly to the strength of the roof when the grout was worked into it. This finished surface was kept moist for three days, and then a 5-ply felt and slag roof was applied. The completed roof, including all supporting members, Porete slabs, grout finish, and slag roofing, weighed less than 12 pounds per square foot of surface, the slab alone weighing 7 pounds.

Siding slabs were ap-



A LIFE-SIZE PICTURE OF A PIECE OF PORETE SLAB



LAYING PORETE SLAB ROOFS

plied to the angle iron side wall stringers. Porete wall slabs are held by means of clips on the angle iron horizontal stringers. These angle irons were placed on 32-inch centers with one face in the plane of the building wall and one edge up. By means of clips similar to those used on the roof, siding slabs were secured to the purlins, and as fast as a wall was finished, a stucco coat  $\frac{3}{8}$ -inch thick, of standard specifications as to sand, cement and lime, was applied. Masons applying this coat said that Porete took the stucco admirably.

The east face and north and south ends of the building were finished in this manner, while the slabs on the west face were left unfinished for the purpose of demonstrating and experimenting with various kinds of surfacing.

Porete can be used for any of the following kinds of construction:

- Fire-proof roofs which are very light in weight, for industrial buildings, theaters, auditoriums, banks, etc., where Porete is applied to channel purlins and metal lumber joists
- Fire-proof side walls or partitions for commercial garages and warehouses
- Dwelling houses with any desired stucco finish
- Individual garages where a stucco finish is desired
- Furring material for brick and concrete walls and roofs
- Cement or tile floors on wooden beams or metal lumber joists

## Large Portland Cement Output in September

THE movement of Portland cement continued on a large scale throughout September, 1921, more than 11,300,000 barrels having been shipped from mills. Shipments of Portland cement during the third quarter of the year were approximately 33,970,000 barrels, establishing a record for this quarter. For the nine months ending September 30, 1921, the shipments amounted to 74,045,000 barrels, which exceeds the former record volume moved in the corresponding period in 1920.

Favorable operating conditions are indicated by the large September production of 10,027,000 barrels of finished cement, which established a record for that month. The average daily production was greater than that of August, and had there been as many days in September as in August, the September production would have shown the larger total. Production for the third quarter likewise established a record, and

for the nine months ending September 30 production was about 99.8 of the record quantity made during that period last year.

These statistics, prepared under the direction of Ernest F. Burchard, the U. S. Geological Survey, Department of the Interior, are based mainly on the reports of Portland cement manufacturers and in part on established data. A large quantity of the cement, probably 20 per cent of the output, is now going into the construction of concrete roads. This is a large increase over former periods. The value of building permits issued within the last three months has shown a large total. A revival of building activities is well under way, probably to a greater extent than is generally realized. A great deal of the cement used in construction work is being consumed on small to moderate-sized jobs, as few large engineering projects are under way and industrial building is only slightly active.

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## ASSOCIATED GENERAL CONTRACTORS

### NEWS NOTES AND COMMENTS

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#### Western Construction Campaign Started at Minneapolis Meeting

**C**ONSTRUCTION, the key to unemployment, as pointed out by Herbert Hoover in a letter addressed to W. O. Winston, President of the Associated General Contractors, is the message which is being carried over the country by members of the Executive Board of the Associated General Contractors in a 10,000-mile campaign now in progress. The present campaign includes the principal cities of the West, in each of which meetings of governors, mayors, citizens, business men and contractors have been called to discuss the present situation and ways and means of starting the construction program to relieve it.

During the latter part of October meetings were held in Minneapolis, Des Moines, Omaha, Denver, Salt Lake City, Spokane and Seattle. During November 1-16 the party covered Portland, San Francisco, Los Angeles, El Paso, Dallas, Oklahoma City, Kansas City and St. Louis.

One hundred and twenty-five contractors attended the first meeting on the schedule for the western trip of officials and directors of the A. G. C., which was held at Minneapolis, October 17, under the auspices of the Northwestern Association of General Contractors. The reception of our representatives and the response to their effort were cordial and hearty.

In opening the meeting, President Ffolliott announced that a local committee would be formed to work with the committees of the President's Unemployment Conference, and declared that the contractors of the Northwest are behind Mr. Hoover. E. H. Brown, an architect of Minneapolis, who had been called into the conference at Washington, emphasized the importance of such a committee, to be composed of representatives of labor, materials men, professional men and constructors, for spreading the spirit of that conference, which he epitomized as "coöperation combined with patriotism."

J. H. Ellison, Chairman of the Organization Committee of the A. G. C., announced

that recommendations would be submitted at the general convention next January along the following lines: that the constitution and by-laws of an affiliated organization should follow that of the national organization; that the United States be divided into four zones, each to be represented by a vice-president, and into nineteen districts, each to be represented by a director; that the general officers be elected by the Association as a whole; that chapters be not less than state-wide; that dues be proportionate to the amount of business done by a member during the previous year.

The purpose of the trip was set forth by President Winston as "a campaign for members in the A. G. C. and a campaign to outline to non-members as well as to members the organization plan," and he spoke of the matter of dues as being a proper overhead expense in a contractor's business, since the A. G. C. works in the interest of the public and to eliminate waste. He said:

"I urge you to support both your national and your local associations, believing as I do that through these agencies is to come the realization of my hopes and my desires."

Then came the turn of the directors present. D. A. Garber spoke, first, of "the earnest desire of all our people of the United States that this particular administration should be a wonderful success," and pointed out that the hope for this lies especially upon Secretary Hoover, who "has turned the Department of Commerce into a business department." Referring to the growing respect for the business of construction, an industry based on the fundamental need for shelter, he declared that the aim of the A. G. C. is to bind together the problems of every class of constructors, for mutual support. The A. G. C. already has over 1,300 members, he said, and its dues are far lower than those of most trade organizations.

Mr. Garber spoke again to tell the meeting that in the recent Congressional investigation, no general contractor was indicted for price fixing or fraud against the Government.

## Legal Decisions in the Contracting Field

Edited by A. L. H. Street, Attorney-at-Law

### Phases of Highway Construction Contracts

In the comparatively recent case of *Osborne vs. Suter*, 220 S. W., 481, the Arkansas Supreme Court had occasion to lay down the following summarized propositions of law:

Where a contract for the construction of a road was let in accordance with a bid for furnishing all material, tools and labor for a stated amount, upon completion of the contract the contractor was entitled to the specified amount, and nothing more, regardless of whether the work was under or over the engineer's original estimate, notwithstanding that the proposal to bidders provided for payment for actual work performed.

The fact that a contract for the construction of a highway required the contractor to furnish all material, tools and labor for a specified amount did not prevent the highway commissioners from having extra work done without materially altering the general plan of the improvement, and when the contractor performed such extra work he was entitled to compensation therefor.

Where a contractor proposed to construct a road for a specified amount, and also to furnish certain extras without additional compensation, such extras could not be charged for as extras, they being covered in the bid submitted.

A contractor for the construction of a highway could not recover for extras, where he did not show that such work was not covered by the plans and specifications upon which his bid was proposed.

Under a contract for the construction of a road, providing that the work should be done within a certain number of days, and that liquidated damages at \$10 per day should be paid for all the time in excess thereof, where delay resulted from causes beyond the contractor's control and not within the contemplation of the parties, damages therefor under the contract could not be charged.

### Obligation of Municipality to Award Extra Compensation to Contractor

Where a city orders departure from a contract for the construction of a public building—such departure as substitution of materials, etc.—there is at least a moral obligation on the part of the city to reim-

burse the contractor for the extra cost of performing his contract, and this obligation is sufficient to sustain the validity of an ordinance directing issuance of a warrant to the contractor, holds the Oregon Supreme Court in the case of *State v. Funk*, 199 Pacific Reporter, 592.

### Liability of City to Contractor for Mistake in Estimates

One bidding for a municipal street improvement contract is entitled to rely upon the city's estimates of embankment required to be constructed as being substantially correct, and may recover damages for loss resulting from negligence in the preparation of the estimates on being awarded the contract and subsequently discovering the error. In reaching this conclusion in the case of *Palmberg v. City of Astoria*, 199 Pacific Reporter, 630, the Oregon Supreme Court recently said:

"Here the advertisement for bids was inserted by virtue of the provisions of the charter prepared by the city's agents, and was, therefore, the city's invitation to bid, and whatever representations it contained were the city's representations. When the advertisement, by a mistake amounting to negligence, materially understated the amount of embankment which the contractor would be required to construct, it was the city's misrepresentation; and if the contractor had a right under the circumstances to rely upon it as being approximately correct, and so relying, made a ruinous bid, we see no reason, if the other elements necessary to a recovery are present, why the city should not be held liable; and this, not on the ground of a contract . . . for the reasonable value of the labor and expense of the contractor in bringing the embankment up to grade, but as damages for a negligent act whereby the contractor was induced to enter into the contract and to expend a greater sum in completing it than would have been necessary had the conditions been correctly stated. . . . We do not believe that, in view of the advertisement and the representations therein, it was incumbent upon the contractor to make new surveys or calculations from an independent profile, if this profile and the accompanying specification were all that were on file, in order to verify the city surveyor's calculations."

# MATERIALS-MACHINERY

The catalogs and pamphlets listed below are available for free distribution. Contractors and Engineers who check over these pages each month and write for such material as interests them, will find this a valuable means of keeping up to date on the subject of machinery and equipment.

# MOTOR TRUCKS, ETC.

## PEDESTAL CONCRETE PILES

Full information regarding the value and advantages of pedestal concrete piles for foundation work, particularly in poor soil, may be secured by writing to the MacArthur Concrete Pile and Foundation Company, 12 John Street, New York City.

## A SPEEDY RIVET-CUTTING MACHINE

In Book 6, issued by the Rivet Cutting Gun Company, 116 East Third Street, Cincinnati, Ohio, this company describes its portable rivet-cutting machine, which is particularly handy for contractors dismantling steel structural work, cutting concrete foundations or any other class of masonry.

## QUALITY IN ROAD-BUILDING MACHINERY

The Acme Road Machinery Co., Frankfort, N. Y., will be glad to send to interested contractors its complete line of descriptive matter covering road-building machinery for every purpose.

## RADIAL BRICK CHIMNEYS

The catalog of the American Chimney Corp., 147 Fourth Ave., New York City, contains interesting and valuable information regarding the construction of radial brick chimneys.

## NEW ROAD MACHINERY CATALOG

The Austin-Western Road Machinery Co., Chicago, Ill., has just issued a new General Catalog No. 21-F, describing the new Austin tandem gasoline roller, scarifier and other dependable road machinery.

## SELF-LOADING SCRAPERS FOR GRADING

The Baker Manufacturing Co., 503 Stanford Ave., Springfield, Ohio, will be glad to send its interesting illustrated literature describing Baker-Maney self-loading scrapers, which dig, load, haul, dump and spread.

## DEPENDABLE GASOLINE MOTORS

The Wisconsin Motor Manufacturing Co., Milwaukee, Wis., will be glad to send its literature describing Wisconsin motors in the contracting field, for use in gasoline locomotives, road pavers, cranes and other machines needing a dependable source of power.

## A PORTABLE SPRAY-PAINTING OUTFIT

The DeVilbiss Manufacturing Co., Toledo, Ohio, will be glad to send to any contractor a copy of its literature describing the DeVilbiss portable spray-painting system, for spray-painting the interiors and exteriors of buildings, railway equipment, bridges, ships, etc.

## IRON FENCE AND WINDOW GUARDS

The Stewart Iron Works Co., 527 Stewart Block, Cincinnati, O., manufacturers of iron fence, lawn vases, park and lawn settees, iron and wire window guards, will be glad to furnish literature on the above subjects on request by interested parties.

## CAST IRON PIPE

The Lynchburg Foundry Co., Lynchburg, Va., will be glad to quote prices on cast iron water and gas pipe, flanged pipe and flanged fittings under standard or special specifications.

## HAND AND MOTOR FIRE EQUIPMENT

Facts concerning hand and motor fire equipment for mounting on commercial chassis may be secured by writing to the O. J. Childs Co., Utica, N. Y.

## SHORT WHEEL BASE MOTOR TRUCKS

The many advantages of short wheel base motor trucks for contractors in the construction, road-building and general hauling field are described in detail in the literature of the Autocar Co., Ardmore, Pa.

## JACKS FOR ALL TRADES

The Doughboy jack, a particularly adaptable light-weight jack for the contractor, is described in detail in Bulletin 29, which may be secured from McKiernan-Terry Drill Co., 19 Park Row, New York City.

## FULL-CIRCLE AUTO CRANES

The Byers Model 7 full-circle crane for all types of contracting and industrial work is described in detail in a series of special bulletins, which may be secured from the Byers Machine Co., 480 Sycamore St., Ravenna, Ohio.

## PORTABLE CENTRIFUGALS FOR UNWATERING TRENCHES, ETC.

The Evinrude Motor Co., Milwaukee, Wis., has just published a bulletin describing the Evinrude light-weight portable centrifugal for unwatering trenches, catch-basins, flooded areas, excavations, pits, etc., which it will send to any contractor on request.

## ROAD BUILDING WITH MOTOR TRUCKS

The new GMC road-building truck, especially built for this service, is described in detail in special circulars, which may be secured from the General Motors Truck Co., Pontiac, Mich.

## CONCRETE-HANDLING CARTS

Keystone concrete carts, manufactured by the Gray Iron Foundry Co., Reading, Pa., speed up the handling of concrete, particularly in building construction, and are described in detail in the bulletins of this company.

## CONVEYING MACHINERY

The Weller Manufacturing Co., 1820-1856 N. Kostner Ave., Chicago, Ill., publishes an interesting and instructive catalog describing its conveying machinery, particularly adaptable to contracting work.

## THE USE OF ASBESTOS SHINGLES

Contractors interested in securing more information and data on the value and use of asbestos shingles should write for the literature of Johns-Manville, Inc., Madison Ave. and 41st St., New York City.

## SHOVEL ECONOMY

Any steam shovel is a means of moving dirt, but the Thew Shovel Co., Lorain, Ohio, claims that in its catalogs, which are free to any contractor requesting them, it shows wherein Thew power shovels are particularly economical and efficient.

## WIRE MESH FOR ROAD REINFORCEMENT

Truscon wire mesh, furnished in flat sheets cut to length for reinforcing concrete highways, is described in detail in the illustrated literature of the Truscon Steel Co., Youngstown, Ohio.

## CRANES AND DERRICKS

The Terry Manufacturing Co., Grand Central Terminal, New York City, has been in the business of manufacturing cranes and derricks for over a quarter of a century. Its catalog will be of interest to any contractor in the field for this type of equipment.

## APPLYING BITUMINOUS MATERIALS TO ROADS

Equipment manufactured by the Kinney Manufacturing Co., 3429 Washington St., Boston, Mass., mounted on motor trucks for applying hot or cold bituminous materials to roads, is described in pamphlets which will be of interest to contractors and engineers having such work in prospect for 1922.

**EXPANSION JOINTS FOR IMPROVED PAVEMENTS**

Ideal expansion joints manufactured by the Waring-Underwood Co., Fernwood, Pa., for granite, brick, wood block and concrete pavement, are described in literature which may be secured free on request.

**CORRUGATED CULVERTS THAT LAST**

The Newport Culvert Co., 542 West 10th St., Newport, Ky., has issued a booklet giving complete data on Newport culverts, full-round and half-round, made of genuine open-hearth iron guaranteed to be more than 99 per cent pure iron copper alloy.

**CLAM-SHELL BUCKETS**

The Owen Bucket Co., 418 Kirby Bldg., Cleveland, Ohio, manufacturers of Type O Owen buckets for handling all types of material, will send on request its illustrated, descriptive bulletins.

**PRESERVATIVE PAINT FOR MACHINERY**

Contractors preparing to lay up their machinery for the winter should protect it with a good preservative paint. Full information regarding Pioneer preservative paints may be secured from the Pioneer Asphalt Co., Lawrenceville, Ill.

**STRUCTURAL STEEL WORK**

The Pittsburgh-Des Moines Steel Co., 836 Curry Bldg., Pittsburgh, Pa., specializes in structural steel work, and will design, fabricate and erect this type of work of any description. Contractors desiring information regarding the work may secure it from the above address.

**HIGH-GRADE CONTRACTING LOCOMOTIVES**

The H. K. Porter Co., Pittsburgh, Pa., will be glad to send its literature describing Porter locomotives, which have been in use extensively by large contractors on all types of contracting work.

**POWER CONCRETE MIXERS**

Bulletin No. 106, published by the Ransome Concrete Machinery Co., 1772 Second St., Dunellen, N. J., describes in detail the uses and advantages of small-size concrete mixers.

**PORTABLE CONVEYORS FOR BRICK AND LOOSE MATERIALS**

The use of Haisa portable belt conveyors for handling brick, stone, sand, etc., is described in detail in a booklet which may be secured from the George Haisa Mfg. Co., 143d St. and Rider Ave., New York City.

**CONCRETE ROAD PAVERS**

A heavy-duty concrete paving mixer which has an established reputation for service and yardage is described in the literature of the Koehring Co., Milwaukee, Wis.

**INDUSTRIAL CARS, BATCH BOXES AND TRUCKS**

The Koppel Industrial Car and Equipment Co., Koppel, Pa., in its road catalog No. 100 describes in detail its full line of industrial cars, batch boxes and trucks for handling aggregate for concrete roads or mixed materials.

**ASPHALT PAVING TOOLS AND TOOL HEATERS**

Littleford Bros., 500 East Pearl St., Cincinnati, Ohio, manufacturers of a complete line of tar and asphalt heaters, will send their catalogs of pouring pots, asphalt paving tools and tool heaters to any interested contractors or municipal engineers.

**MAINTAINING ASPHALT STREETS**

The contractor or engineer having to do with the maintenance of different types of bituminous asphalt streets will be interested in the literature of the Equitable Asphalt Maintenance Co., 1901 Campbell St., Kansas City, Mo., describing the Lutz surface heater, which increases the daily output of the repair gang.

**AUTOMATIC UNLOADING, LOADING AND CONVEYING MACHINERY**

Full information regarding the types of automatic loading, unloading and conveying machinery adaptable to various services will be found in the literature of the Fairfield Engineering Co., Lancaster, Ohio.

**GRADING WITH TRACTORS**

Any contractor with a large grading job, whether it be for road work, the preparation of a new golf course, or in reclamation work, will find interesting data in the latest folders of the Cleveland Tractor Co., 19211 Euclid Ave., Cleveland, Ohio.

**WELDED STEEL TANKS**

Hydro-pneumatic tanks built for a working pressure of 100 pounds for the storage of gasoline and road oil or as air receivers are described in detail in literature which may be secured from the Heil Co., 1243 26th Ave., Milwaukee, Wis.

**A CONCRETE FLOOR FINISH AND HARDENER**

The General Chemical Co., 25 Broad St., New York City, will be glad to send copies of its Hard-n-tyte Specification, which shows how to use its new complete floor finish to produce non-dusting and permanent wearing concrete floor surfaces.

**WHY CHLORINATE WATER?**

This is the title of a new booklet issued by Wallace & Tiernan, Inc., Newark, N. J., which contains data and valuable material regarding the use of liquid chlorine in sterilizing municipal water-supplies.

**ROCK CRUSHING AND SCREENING EQUIPMENT**

The special catalog of the Good Roads Machinery Co., Inc., Kennett Square, Pa., describing its Champion crusher with elevator, screen and portable bin, is of particular interest to contractors having crushed stone production problems on hand.

**A WATER-WORKS CENTRIFUGAL PUMP**

Bulletin 242 published by Dayton Dowd Co., 346 York St., Quincy, Ill., describes in detail the company's various types of centrifugal pumps for municipal and private water-supply systems.

**PAVING MIXTURES ON THE JOB**

T. L. Smith Co., 1125 32d St., Milwaukee, Wis., has issued a new catalog, "On the Job with Smith Paving Mixers," which contains actual photographs of various jobs throughout the country, together with descriptions of all types and sizes of Smith paving mixers.

**TRACTORS IN ROAD BUILDING AND GRADING**

The C. L. Best Tractor Co., San Leandro, Calif., has issued an interesting series of four bulletins showing its 30 and 60 models Best Tracklayer tractors in road-grading and road-building work.

**NEW DIPPER DREDGE BULLETIN**

A new dipper dredge bulletin, entitled R-1, describing the work of dipper dredges for river, harbor and canal excavation, has just been issued and may be secured by writing to Bradlee Van Brunt, Bucyrus Co., South Milwaukee, Wis.

**DATA ON METAL LATH FOR BUILDINGS**

The Berger Manufacturing Co., Canton, Ohio, has published an interesting illustrated booklet describing Berloy, Ribbles metal lath, channels, corner bead, lattice lath and wall ties, which will be of particular interest and value to the building contractor.

**WHEEL SCRAPERS FOR CONTRACTORS**

Contractors interested in securing a wheel scraper which is a real time- and money-saver should obtain a copy of Special Bulletin F 118, which may be secured from Smith & Sons Mfg. Co., 1512 Guinotte, Kansas City, Mo., describing Roytrac unit wheelers.

**A NEW EXCAVATING EQUIPMENT CATALOG**

Pawling & Harnischfeger Co., Milwaukee, Wis., has just issued Bulletin 56X, which contains records and illustrations of the actual performance of P & H excavators under widely divergent conditions of service and application, together with facts and figures of interest to contractors.

**CONCRETE SPOUTING EQUIPMENT**

The Standard Scales & Supply Co., 1631 Liberty Ave., Pittsburgh, Pa., manufacturer of the Standard line of contractors' equipment, will send its catalog No. 69, describing its full line, including spouting equipment for handling concrete.

**SERVICEABLE CAST IRON PIPE**

A cast iron pipe which may be laid with the use of a wrench and which entirely eliminates caulking is described in detail in the Universal cast iron pipe bulletins, which may be secured from the Central Foundry Co., 90 West St., New York City.

**SEWER PIPE**

Full information regarding high-grade sewer pipe made by the Delaware Clay Products Co., 807 Westinghouse Bldg., Philadelphia, Pa., may be secured from this company.

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## CONTRACTORS', ENGINEERS' AND MANUFACTURERS' NOTES

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### De Wind with Mussels, Ltd.

N. DeWind, well known by municipal and county officials and contractors throughout the United States, and formerly connected with the Austin Manufacturing Co., Chicago, Ill., is now connected with Mussels, Ltd., with headquarters at the Toronto office of this company. He has charge of the Highway Departments throughout Canada.

### New Treadwell Hoist

A complete new line of steam and electric-driven hoists has been placed on the market by the Treadwell Engineering Co., Easton, Pa. Prior to this time, the company for many years manufactured solely its complete line of rolling-mill equipment. The chief engineer of the hoist department of the Treadwell Engineering Co. is Thomas O. Werner, formerly chief engineer of the S. Flory Manufacturing Co. The new hoist is a machine made in sizes from 100 to 300 horse-power and capable of operating under all conditions.

### New Chain Belt Offices

The Chain Belt Company, Milwaukee, Wis., has opened offices at 735 Ellicott Square, Buffalo, N. Y., and has announced the appointment of T. E. Cocker as district manager of that territory. For the past five years Mr. Cocker has had considerable experience in handling elevating and conveying equipment, and will assume charge of the Rex line of the Chain Belt Company, including chain, sprocket wheels, Rex traveling water screens, elevators and conveyors.

### Lakewood Moves Philadelphia Office

The Lakewood Engineering Company, of Cleveland, Ohio, has announced that its Philadelphia, Pa., office has been moved from the Widener Building to the Franklin Trust Building.

### Ackenheil Joins Heltzel

J. D. Ackenheil, formerly connected with the Portland Cement Association as field engineer in the Pittsburgh District, has joined the Heltzel Steel Form and Iron Company, Warren, Ohio. Mr. Ackenheil has had considerable experience along the line of road building in a promotional and constructive capacity, having had supervising charge of a number of important highways. The subject of steel forms has been one of his studies from a constructive view-point during his four-year service with

the Association, and he is therefore well fitted to advise and confer with contractors and engineers as to forms and other details of high construction. He will act as Special Representative for the Heltzel Steel Form and Iron Company.

### New Steel and Wire Representative

The American Steel and Wire Company, 208 South LaSalle Street, Chicago, Ill., has announced the appointment of E. E. Aldous, as representative of the company in the St. Paul-Minneapolis-Duluth territory, with headquarters at St. Paul. Mr. Aldous has been connected with the company for twenty years in different positions, is well posted on the different products of the American Steel and Wire Company and is eminently qualified to represent it.

### Three Consulting Firms Unite

The new company incorporated under the name of the Randolph-Perkins Company, Engineers and Managers, 1210 First National Bank Building, Chicago, Ill., has been formed as successor to Isham Randolph & Company, The Edmund T. Perkins Engineering Company, and the George B. Massey Company. The incorporators and officers of the company are: LeRoy K. Sherman, president; George B. Massey, vice-president; Charles T. Mordock, treasurer, and Robert Isham Randolph, secretary.

Mr. Sherman was formerly chief engineer and vice-president of the Edmund T. Perkins Engineering Company, and during the war was president of the U. S. Housing Corporation. Mr. Massey is a mechanical engineer, specializing in excavating machinery and methods. He is at present making an extended investigation and report for American clients on projects in India. Mr. Mordock was formerly Chicago representative of the J. G. White Company, and he specializes in public utilities. For the past year he has represented Blodgett & Company of Boston, in Chicago. Mr. Randolph was formerly senior partner of Isham Randolph & Company, specializing in land drainage, levees and pumping plants.

### New Cincinnati Office

The U. S. Cast Iron Pipe and Foundry Company, Burlington, N. J., has announced the opening of a new office at 811 Dixie Terminal Building, Cincinnati, Ohio. P. T. Laws, Assistant Works Manager, will make this office his headquarters. Sales from this office will be in charge of Harold G. Henderson.

## Tractor, Trailer and Motor Truck—Solving Hauling Troubles for Contractors

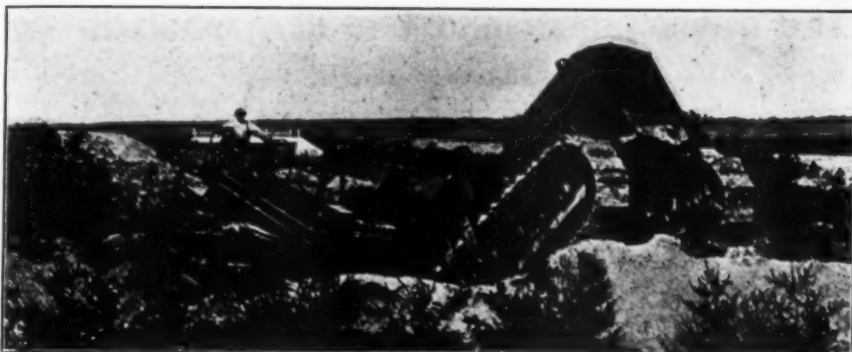


NASH-QUAD TRUCK HAULING LEE TRAILERS IN PROVO CITY, UTAH, ROAD WORK



WATERLOO TRACTOR HAULING GRAVEL-SPREADING MACHINE ON THE WILMINGTON PIKE, WEST CHESTER, PA.

The road surface is prepared for resurfacing by sweeping, the tar is then applied and then the gravel spread by the machine. Two men stand at the ends and shovel the gravel into the hopper; it then drops onto the revolving cone and is scattered across the road

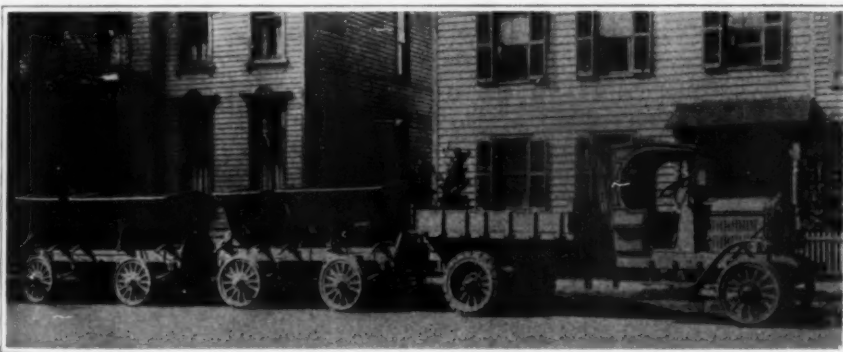


THE DEEP DRAINAGE DITCH SHOWN AT THE RIGHT WAS RECENTLY CONSTRUCTED IN NORMAN COUNTY, MINN.

On a 9-mile stretch, the ditching machine threw out 106,000 yards. This dirt was levelled off and made into a 20-foot roadway in 9 days by a 10-ton Holt tractor pulling a Stockland giant grader



A GROUP OF FEDERAL TRUCKS USED FOR ALL KINDS OF HAULING UNDER VARYING CONDITIONS, BY THE ATLAS EXCAVATING COMPANY, DETROIT, MICH.



A LARRABEE-DEVO TRUCK WITH A TRAIN OF TROY TRAILERS IN USE IN BINGHAMTON, N. Y.

# The Development and Use of Asphalt in the United States

By **Prévost Hubbard**

Chemical Engineer, The Asphalt Association

**P**RIOR to 1902 the term asphalt was confined almost exclusively to certain semi-solid or solid bitumens which were found in natural deposits, most of which occurred in admixture with clay, silt or vegetation which could not be removed by ordinary refining methods. When the mineral matter predominated, the product was termed asphaltic sand or rock asphalt, depending upon whether or not the mineral structure was loosely or firmly knit together. No appreciable tonnage of asphalt was used in this country until 1883, when about 35,000 tons were imported, mainly from Trinidad, and found their way into the paving industry. Prior to this, relatively small quantities of Trinidad asphalt and certain European rock asphalts or bituminous limestones had been used in the construction of pavements in a few American cities. As most of the European rock asphalts contain less than 15 per cent of asphalt proper, while the refined Trinidad asphalt uniformly carries about 56.5 per cent of bitumen, they were eventually unable to successfully compete with the latter, and until 1892 Trinidad asphalt was used to so much greater extent that, in most minds, the term "asphalt" came to mean Trinidad asphalt.

In 1892 a relatively pure asphalt deposit occurring in Venezuela and known as Bermudez Lake asphalt was exploited in small quantities, and this product began to find its way into the United States, where it was used in pavement construction. From this time on, Trinidad asphalt was obliged to share honors with Bermudez asphalt, the importation of which gradually increased, until at the present time it is nearly equal in tonnage to the Trinidad asphalt. Other foreign asphalts occurring in Venezuela, Cuba and elsewhere have appeared temporarily on the American market, but never in any great quantity. Large deposits of asphaltic sands and rock asphalt have been found in this country, but their development has been limited, as many are unsuited

for present industrial purposes. Comparatively small deposits of very hard and nearly pure asphalt commonly known as Gilsonite, Uintaite, Grahamite and Wurtzilite have also been discovered in various parts of the United States and have been found particularly well suited for the manufacture of asphalt specialties. Their combined available tonnage has, however, been so small that their use in the two main asphalt industries—paving and roofing—has been very limited.

## Native Asphalt

Practically all native asphalt is too hard for direct use in the manufacture of asphalt products, and after a simple refining process, which consists in heating the crude material until water, gas and other volatile material is driven off, it must be softened to suitable consistency by combining it with the proper amount of residual petroleum, known as flux oil. Petroleum, therefore, always served as an important integral part of all asphalt used for industrial purposes. For many years it was believed, and it is now generally admitted, that all asphalt originates in petroleum.

The petroleum first known and used in the United States, occurring in Pennsylvania, Ohio and Indiana, was of the paraffin type. When distilled to remove the more volatile constituents, this petroleum was found to yield a thick, greasy oil residue which in no way resembled asphalt except in color, but which proved quite satisfactory for use as a flux. If distillation was carried further, this residual oil underwent certain chemical changes, due to cracking of the hydrocarbon constituents, and eventually coke remained in the still.

As early as 1865 it was known that bituminous material was susceptible to the action of certain oxidizing agents which caused the product to become more viscous, and in 1894 Francis X. Byerly was granted a patent for blowing air through petroleum residue when heated to between 400° and

600° F. By this process it was found possible to produce a semi-solid residue which in some ways resembled the native asphalts, but which, with the type of oil used, was more or less cheesy in character and lacked the cementing power of the then known asphalts. This product was marketed as Byerlyte asphalt, but never found much favor in the paving industry because of the inferior results attending its use. It was found, however, that when so treated, residual oils from petroleum occurring in the Gulf section yielded a better grade of product than the more highly paraffin type of petroleum.

#### California Petroleum

With the discovery and refining of California petroleum it was observed that when the residual oil was further distilled and before coke was formed, a semi-solid residue was produced which very closely resembled the native asphalts. The original petroleum was therefore called asphaltic petroleum. The asphalt first manufactured from this type of petroleum proved to be of rather inferior quality, which was later shown to be due to the high temperatures required to drive off a sufficient amount of oil constituents to produce a semi-solid residue. At such temperatures the hydrocarbons began to crack up, with the formation of undesirable decomposition products. Later it was found that if distillation was conducted, with a copious amount of steam used to agitate the contents of the still, cracking could be largely prevented, as the volatile products were removed at a much lower temperature. This discovery not only assured a large future supply of high-grade asphalt from domestic sources, but conclusively proved that asphalt originates in certain petroleum; that it is actually held in solution in such petroleum; and that when recovered by suitable means it is essentially the same as certain native asphalt.

By 1902 petroleum asphalt was on the American market in appreciable quantities; about 20,000 tons was manufactured during that year. It found its way into the paving industry, where it was received on trial for a number of years, until service over a considerable period of time demonstrated that it was equally as good for paving work as the lake asphalts. By 1911 the tonnage of asphalt produced from domestic petroleum

exceeded the importation of Trinidad and Bermudez asphalt, and from that time on the production from this source has grown rapidly.

In 1913 large quantities of Mexican petroleum found their way into the United States. This petroleum is highly asphaltic in character and when subjected to steam distillation yields a much higher percentage of asphalt than any petroleum found in the United States. About 100,000 tons of asphalt were produced in 1913 from this source, as compared with about 230,000 tons of imported native asphalt and over 400,000 tons of asphalt produced from domestic petroleum. This year showed the peak of importation of native asphalt, which was at that time equal to only a little more than two-fifths of the total production from petroleum. From that time on there has been a general decline in importation of lake asphalt with a very rapid increase in asphalt distilled from petroleum.

The growth in asphalt tonnage from Mexican petroleum has been even more remarkable than from domestic petroleum, and since 1918 has exceeded the latter. Statistics of the U. S. Geological Survey for 1919, which are the latest ones available, show the following:

	Tons	Per Cent
Asphalt from domestic petroleum .....	614,692	41.4
Asphalt from Mexican petroleum .....	674,876	45.5
Domestic native asphalt (bituminous rock) .....	53,589	3.6
Other domestic native bituminous substances .....	34,692	2.3
Asphalt imported from Trinidad and Tobago .....	51,062	3.5
Asphalt imported from Venezuela .....	47,309	3.2
Other imported asphalts, including bituminous rock .....	7,277	.5
	<hr/> 1,483,497	<hr/> 100.0
Asphalt exported from the United States .....	40,208	

Approximate consumption of asphalt in United States .....

1,443,289

NOTE.—This does not include manufactures of asphalt, which are valued at approximately one-half the value of the tonnage of asphalt exported.

From this table it is seen that nearly 87 per cent of all asphalt produced by, or imported into, this country is obtained from the distillation of petroleum. If the min-

eral and other extraneous matter in rock asphalt and Trinidad and Bermudez asphalt is eliminated, a conservative estimate would raise the proportion of petroleum asphalt to over 92 per cent of the total, leaving about 1.4 per cent Trinidad bitumen and 3.2 per cent Bermudez. The fact that the bitumen of lake asphalt now constitutes less than 5 per cent of the total asphalt consumed by the United States may be surprising to the many who have heretofore considered the lake asphalts as the most important.

In spite of the large tonnage of asphalt produced from domestic petroleum, its manufacture from this source constitutes only a very small part of the petroleum industry. The specific gravity of domestic petroleum asphalt averages about 1.01, or 8.4 pounds per gallon. On this basis the volume of

domestic petroleum asphalt for 1919 amounts to about 146,000,000 gallons, as against approximately 15,864,000,000 gallons of crude oil, or less than 1 per cent by volume of crude. Mexican oil asphalt averaging 1.04 specific gravity shows about 155,000,000 gallons for 1919, as against approximately 2,218,000,000 gallons of Mexican crude oil, or about 7 per cent. When it is considered that practically all Mexican petroleum is highly asphaltic in character, these figures show the possibility of increase in asphalt production from this source to be very great as the demand increases. At the present time an enormous quantity of asphalt present in crude petroleum and many times greater than the amount actually produced is not being recovered, but is burned as fuel oil.

## A General-Purpose Crawling Tractor Crane

**T**O meet the need for a full-revolving tractor crane which can be operated independently of rails, the Industrial Works, Bay City, Mich., has begun the manufacture of the new crawling tractor crane Type BC, illustrated on page 69. The crane is built in two types: Type BC with a capacity of 20,000 pounds at 12-foot radius, equipped with continuous crawling tractor belt; and Type BT with a capacity of 18,000 pounds at 10-foot radius, equipped with four broad-gage tractor wheels.

These cranes are particularly adapted to the needs of road contractors, coal dealers, gravel, sand and stone producers, foundries and moderate-size manufacturing plants. The capacity and speed of these cranes make them well suited for moving coal, sand, gravel and dirt and for excavating work. Within the limits of their capacity they will serve with the same efficiency as the locomotive crane. The maximum utilization of yard storage space is realized with the use of these cranes, because their field of usefulness is not limited by railroad tracks, as is the case with the railroad crane. Having exceptionally large capacities in ordinary lifting, they prove a valuable adjunct on many erection jobs which are inaccessible to the railroad crane. They can be equipped to handle hook and block, grab bucket, drag scraper bucket, wood grapple, electric lifting magnet, shovel dipper and pile driver leads with drop hammer.

The crane is operated by means of an internal combustion engine which has the advantage of being always ready for immediate use. When not in operation no fuel is consumed, and it is not necessary, as often with the steam-operated machine, to have a licensed engineer as operator.

Great care has been taken to combine necessary strength with the light weight essential to a tractor crane, and convenience in operation and maintenance have been provided for in every detail. Realizing the importance of ease of operation in getting the most work out of locomotive cranes, the manufacturers made special study of the requirements of the operator, and everything was arranged with a view to making the operation and maintenance of the machine as easy and convenient as possible. Up to the capacity of the motor, any combination of slewing, hoisting the load and varying the radius may be made. The crane is equipped with a 30-foot boom, made up of two channels strongly latticed with angles and tie plates.

The steering of this crawling tractor crane while propelling is accurately controlled by the operator from his position in the revolving upper works, by manipulation of the friction clutches and brakes, controlling the motion of each tractor belt. By means of these clutches and breaks, either tractor belt can be readily and instantly disconnected from the motor while the other belt continues traveling at the normal rate of speed. The disconnected tractor belt can be held stationary by applying the brake, and can be allowed to coast with the brake and clutch both disengaged, or the clutch can be allowed to slip, thus allowing the operator to turn as sharp or as wide a corner as he may choose. All the clutches, brakes and lever mechanism for steering are located in the revolving upper works, where they are simpler to handle and much more accessible than with a portion or all of this mechanism located on the car body.

The propelling and steering mechanism is a new and exclusive feature of the crane. It enables the operator to propel and steer the crane



A MODERATE-SIZED TRACTOR THAT CAN TRAVEL ALMOST ANYWHERE UNDER ITS OWN POWER

independently of all other motion as easily as a wheel or traction tread tractor. The low cost of owning and operating a crane of this type

affords the smaller contractor or industrial institution an opportunity to handle bulky materials speedily, safely and economically.

## A New Small Concrete Mixer

TO meet the demand of a large number of contractors and others who may be able to use a mixer of relatively small capacity, the Ransome Concrete Machinery Company, 1772 Second Street, Dunellen, N. J., has

developed the 4-S Bantam mixer. This new small mixer affords a simple, low-cost, light, easily portable machine capable of handling a one-bag batch of any standard mix and rapidly converting it into high-grade concrete. The

special features of this mixer are the adoption of gear drive and an arrangement by which a 3-point suspension of the drum proper is secured.

Maag gears are used in the gear drive. The teeth are shorter and thicker at the base than is usually the case, and the pinion has teeth of the same shape as those of the gear, a design which materially reduces breakage leverage while adding considerable strength. The line of contact on the flank of Maag gear teeth is longer than on the usual gear and greatly increases the wear-resisting surface. At the same time, the tendency to wear is lessened, as the Maag tooth provides for a maximum of rolling contact and a minimum of sliding contact.

The 3-point drum suspension is secured by bringing the two back main rollers very near together. It is claimed by the makers that with the Maag gear drive and the arrangement for 3-point drum suspension the



A WELL-BUILT, SMALL-CAPACITY CONCRETE MIXER

new mixer becomes the easiest running small mixer on the market. The capacity of the 4-S Ransome bantam is 4 cubic feet of mixed concrete per batch, or 6 cubic feet of unmixed material, with an output of from 3 to 5 cubic yards per hour. The machine is supported by a frame measuring 76 x 36 inches of channel sections mounted on a 4-wheel truck. The mixer drum shell is made of 12-gage steel plate, with cast iron heads held together by tie rods, and is mounted on chilled cast iron rollers. The closure of the openings in the drum when mixing is in progress is accomplished by a sealing

door carried by an arm attached to the discharge operating shaft and revolving with the drum. A 12-gage fixed discharge chute is attached to the mixer frame to receive the concrete when the sealing door is opened. With the mixer a water-measuring tank with a capacity of 9 gallons can be furnished. Power is derived either from a 3-horse-power, vertical, hopper-cooled gasoline engine or from a standard-make 3-horse-power electric motor. Protection for the power unit and driving mechanism is provided by a steel housing, thus prolonging its useful life.

## One Man Can Do the Work of Three

### The Value of Concrete Carts as Labor-Savers

ON construction work, one of the most important points in the handling of concrete is conveying it from the mixer to the columns or wall forms. It is claimed that with a Keystone cart, made by the Gray Iron Foundry Company, Reading, Pa., one man can handle as much concrete as three men with wheelbarrows with much less exertion. It enables the mixer to be operated without interruption. All the weight of the load is carried by the wheels of the Keystone cart illustrated herewith, and none of it on the arms of the worker, so it saves his strength and makes him speedier on the job. This is a special reason why labor prefers this cart to a wheelbarrow. The cart is built with the inside corners smooth and free from obstructions which would have a tendency to delay the flow of concrete. This makes it easy to clean and absolutely watertight. The top edges at the nose and sides are flanged and stiffened by heavy bars. Each corner is tied with bar straps, and the axle runs through the body and is securely fastened with set screws to the hubs inside.

The efficient use of labor is important in keeping the red ink off the ledger. One concrete cart and one man in place of three men laboring with wheelbarrows can help materially.



THE WHEELS CARRY ALL THE WEIGHT IN THIS CONCRETE MIXER

### Hyphenating the Engineer

While engineering has been a recognized profession in the modern sense for a century and a half, a sharp definition of the term has not been written, and thus it means one thing to one person and something radically different to another. It is usual, for want of a better, to fall back on the century-old definition of Thomas Tredgold—"the art of directing the great powers of nature for the services of man." Engineering has become a popular profession in the opinion of the public, with the result that the term "engineer" is frequently hyphenated with another, possibly with the thought that it may carry some advertising force—an idea of doubtful value.

—J. G. D. Mack in *Professional Engineer*.

## A 3-8-Yard One-Man Digger and Loader

A Miniature Dredge or Excavator Which Has Proved Valuable to the Contractor

**W**HEN a contractor is up against a job which necessitates the services of a dredge and an excavator, and yet none of the work warrants a heavy investment in a large type of each of these machines, he can make good use of a Bay City excavator and loader, manufactured by the Bay City Dredge Works, Bay City, Mich. This machine is in reality a miniature dredge, and it is used by small and average-size gravel-pit operators and clay-pit workers whose daily capacity is not great enough to warrant the purchase of a heavy, high-priced steam equipment.

should not be more than \$6 or \$7 per day. It is substantially constructed and will dig in hard or stiff material that can be handled with pick or shovel without blasting. The machine is not recommended for excavation in rock which has not been blasted, or among heavy stumps and roots.

The bed frame of the machine is constructed of steel I-beams, channels and angles securely fastened together and strongly braced, giving a gage of 11 feet and a wheel base of 18 feet. All operating levers are placed well forward and to the right of the mast, allowing the operator



AN ADAPTABLE EXCAVATOR OR DREDGE FOR ONE-MAN OPERATION

The machine can be used in connection with a  $\frac{3}{4}$ -yard bottom-dump dipper or a  $\frac{1}{2}$ -yard clam-shell bucket. It can be mounted on flanged wheels and sectional track or upon caterpillar type trucks. The power is supplied either by a 12-horse-power gasoline engine with clutch pulley or a 15-horse-power electric motor. The dredge has a wide range of adaptability and can be used to dig and load clay, sand or gravel from bank or pit to cars, trucks or wagons; it can also be used by road contractors to cut grades or construct small highway ditches. It is a very serviceable machine for small ditches for farm drainage purposes or for small tile trench excavation.

Only one man is required for the operation of this excavator and grader, and inasmuch as the gasoline engine consumes only 8 to 10 gallons of gasoline in 10 hours, the actual operating cost, including the wages of the operator,

an unobstructed view of his work at all times. The hoisting, backing, swinging and propelling mechanisms are all operated by powerful friction clutches actuating the drums directly. There is provided a suitable lowering and sustaining brake for the dipper, controlled by a foot lever. For propelling, the excavator is mounted on double flanged wheels running on sectional track of 4-foot lengths supported by cross-ties. It is moved ahead by a cable device with hook operated from a drum and attached to the truck. Sectional track and cross-ties are furnished with the machine. At the option of the purchaser, the excavator may be mounted on crawling traction trucks, providing for a quick and easy movement of the machine from one location to another.

The structural boom is made up of two open hearth steel channels, strongly latticed with bars, in a standard length of 24 feet, or a

longer boom can be furnished if necessary. The dipper is of the shovel, bottom-dump type, of  $\frac{1}{2}$ -cubic-yard capacity and is constructed of flanged steel plate, reinforced with bands to withstand hard usage. Detachable cast steel teeth are provided. The dipper is designed with a larger opening at the door than at the mouth, to facilitate dumping. The excavator is also furnished with a clam-shell bucket of  $\frac{1}{2}$ -cubic-yard capacity when desired. The shipping

weight of the loader, including the engine, dipper and machinery, is approximately 16,000 pounds. It is furnished with a framework of steel angles with a sectional roof covering of composition, and the whole machine can be readily taken apart and loaded on trucks or farm wagons for transportation to other locations. It can be assembled in the field ready for operation in from 10 to 15 hours by a crew of three men.

## A Slow-Speed Tractor-drawn Trailer

THE field for the slow-speed trailer among contractors is tremendous, in that practically all of the hauling done by general, building, and highway contractors is of the heavy type which must be done at comparatively slow speed. The Miami Trailer Company, Troy, Ohio, manufactures a new slow-speed trailer for tractor hauling which has many distinctive features of interest to the contractor.

This trailer is of all-steel chassis construction, has a low over-all height of body of 60 inches and is equipped with heavy-duty high-speed roller-bearing equipment. Being tractor-drawn and reversible, the trailer has demonstrated, under most conditions, that it will deliver material at a lower cost per mile than practically any other equipment. In this new trailer design, the Miami Company has attempted to anticipate and overcome every difficulty which has been or may be encountered in road building. The chassis frame is made of 6-inch channel steel, securely riveted at the corners and cross members, using heavy corner irons and angle reinforcement. Two heavy coil springs under tension at each side of the trailer at one end and the rigid construction of the frame take care of all torsional twists that come from operation over uneven roads, relieving the strain that would otherwise be thrown on the body. In order to permit the use in connection with elevating graders, it was necessary to keep the body at a maximum of 60 inches. The Hyatt heavy-duty roller bearings are protected on the inside and outside by dust collars and are adjusted for end thrust. The Alemite lubrication system is used, each bearing being equipped with Alemite grease nip-

ples and each train of wagons is provided with the necessary grease gun. The train of 6 wagons can be lubricated by one person in from 10 to 15 minutes.

Well-ironed white oak is used in the body construction, both on account of its wearing qualities and because of the fact that repairs to damaged parts can be made without its being necessary to have the work done in a machine shop. The bottom doors are made of No. 10 gauge steel, reinforced with 2- by 2 $\frac{1}{4}$ -inch angle steel, provided with a 2-inch overlap, which insures a tight bottom. The double doors open into a space of 38 by 73 inches, insuring the instant dropping of the load when the dumping mechanism is released.

The winding device embraces a shaft running from the front of the trailer to the rear, with a winding spool at each end, operating so that each chain will close both ends tight with one operation. The winding chain can be operated from the ground or from the chassis frame, while the train is in motion.

The tires are 10 inches wide, the wheels being of all steel construction, 44 inches high with  $\frac{3}{4}$ -inch steel spokes. Miami slow-speed trailers are reversible in action and are so designed that a train of trailers can be successfully backed by steering the last wheels of the rear trailer of the train. While this is not often necessary in road construction, it is sometimes the only means of quickly placing the train at a desired point. This new trailer is also made with a reversible platform and as an extension trailer for lumber, pole and pipe hauling, and equipped with two sets of log bolsters to increase its serviceability.

## The Value of Standardization

The new Division of Buildings and Housing, recently established by the Department of Commerce, has announced that a cut of \$600 in the construction costs of the average small house and a reduction of 20 per cent in practically all bills for plumbing equipment are possibilities in the near future. The house construction saving depends largely upon the national adoption of standardized code regulations in regard to fire-walls. The reduction in plumbing costs is also a matter of standardization. According to a special committee which is working on the simplification of plumbing specifications, the existing rules for plumbing equipment in different cities and towns are now as varied and as unsystematized as the autumn winds. Standardization of these local regulations along sound lines will make this reduction possible, in the opinion of the Division.

## Building Floors for Hard Service

Creosoted Wood Blocks with Asphalt Seal Coat Prove Satisfactory

**A** GOOD floor is one that stands surface wear and tear, is resilient and comfortable under the feet of the workmen, is easily cleaned, is non-conducting of heat and cold, lends itself readily to plumbing and wiring and other underfloor repair work, is sanitary and will not create dust, minimizes traffic noise, is easy to install and will last indefinitely.

These are rather exacting specifications but still all are necessary in factory buildings, machine shops and other places where floors undergo severe usage in industrial buildings. The Rodd Company, Century Building, Pittsburgh, Pa., manufacturers Creolignum blocks for industrial flooring. These are wooden blocks treated with a special creosote oil. A joint filler is furnished composed of high grade residual asphalt and gilsonite, cut back with refined naphtha, to which mixture is added a small amount of special gum to eliminate brittleness, to toughen the material and increase its imperviousness to the action of the creosote oil in the blocks. The material takes a permanent set within three to four hours after application, and has a melting point after setting of 200 degrees. It is absolutely firm after setting, but at the same time does not become brittle nor shatter under impact. There is no addition of coal tar pitch, inasmuch as its derivation from the same source as creosote would cause an immediate tendency to soften under the action of the creosote content of the blocks.

The chief superiorities which are claimed for Creolignum asphaltic cement are that it can be applied cold, bonds firmly to the base, and is not affected by the creosote content of the block and, because of its high melting point, it is not affected by a great variation in temperature. Few, if any, failures of wood block



CLOSE-UP VIEW OF CREOLIGNUM FLOOR BEFORE APPLICATION OF SEAL COAT FILLER

floors are on record for any other cause than expansion and contraction. These actions are caused by the variation in moisture content of the blocks. The normal moisture content of the blocks is the same as the moisture content of the atmosphere. This varies somewhat with the seasons and conditions of heat and cold. Therefore, the prevention of expansion or contraction is dependent upon the extent to which excessive variations can be controlled. The absorption or evaporation of moisture takes place on the top surface of the blocks where the open cells of the wood are exposed. It is the function of Creolignum Top Coat to fill and seal these open pores with a permanent material sufficiently high in melting point to remain firm under great variations in temperature. It performs this function because of the fact that in its liquid state it readily enters the wood cells and solidifies there.

The cost of Creolignum Cushion and Creolignum Top Coat is greater than that of pitch but, as most contractors realize from their experience, there is almost no place where asphalt can be used at the same cost as pitch. There are six essential steps in laying Creolignum wood block floors: first, the subgrade is compacted and leveled by rolling; second, a concrete base is laid and finished by floating with a wooden float; third, a seal coat of Creolignum asphaltic cement is spread cold; fourth, the Creolignum blocks are laid tightly by hand; fifth, the joints between the blocks are carefully filled with sand and then Creolignum Seal-coat is squeegeed over the top, thus finally filling the joints and supplying an air-tight seal over the top of the floor; sixth, the floor is finally rolled with a heavy roller to smooth and level inequalities in the laying or the cushion.



FLOOR AFTER APPLICATION OF MOIST-PROOF, ACID-PROOF FILLER

## A Steam Shovel with Rubber Tires

**A** STEAM shovel which will be of particular interest to contractors who have jobs in cities or elsewhere requiring frequent moves over paved roads or highways without injury to the thoroughfares, has been placed on the market by the Osgood Company, Marion, Ohio, in the form of the Osgood 18, a  $\frac{3}{4}$ -yard, traction revolving steam shovel equipped with solid Firestone rubber tires. This shovel is also provided with means for disengaging the traveling gears so that the shovel can be towed by motor truck or tractor, thus permitting traction with a minimum of pulling power. For traveling over streets or highways under their own power, all the Osgood shovels are provided with a two-speed gear arrangement so that the machine travels about  $3\frac{1}{2}$  miles per hour. Steering is accomplished by swinging the upper body slightly to the right or left, which brings instant response from the steering axle.

The rubber tires of the  $\frac{3}{4}$ -yard steam shovel are 40 inches in diameter and 14 inches wide, with ribbed treads, and are mounted on steel rims. The tires are pressed on the regular 34-



**RUBBER-TIRED STEAM SHOVEL READY TO WORK**

inch diameter by 16-inch face cast steel wheels, which permits the removal of the tires when desired, and by attaching the cleats to the rear wheels the shovel is then ready for service where it is not desired to use rubber tires. The outfit is designed and mounted so as to eliminate any possibility of damage to pavement and to permit the movement of the shovel from one location to another with ease, whether towed or moving under its own power.

## A Goose-Neck Boom for Cranes

**I**N adapting a P. & H. No. 206 crane, of the type shown in the accompanying illustration, to the handling of loads such as unit packages of lumber from high piles, it was found that the lengths of lumber interfered with the straight or standard booms. To overcome this and eliminate much of the costly labor required to handle lengths of lumber, pipe, etc., the makers, Pawling & Harnischfeger Company, Milwaukee, Wis., developed the goose-neck boom. As the illustration shows, the boom may be lifted almost straight up without having the load interfere. In other respects this boom is like the standard design and attaches to the gasoline-driven corduroy-traction machine in a similar manner.

The first plant, a furniture factory, using the goose-neck boom, operated it for handling lumber in aisle-ways 18 feet wide, taking lumber in unit packages off 20-foot piles and placing it on wagons or trailers spotted in the aisle-ways. Hardwood at 4 pounds per square foot was handled at the rate of 1,500 square feet per trip. The amount handled per day varied and was limited by the auxiliary equipment, trucks, wagons or trailers, etc., required to carry the



**A BOOM THAT INCREASES THE VERSATILITY OF THE CRANE**

lumber to stock, or to the cut-up room, or for delivery, as the case might be. The company using this P. & H. 206 crane with the new goose-neck boom requires only ten laborers instead of the 25 previously used, making a labor saving of \$60 per day.



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## The Origin of Chrome Nickel Steel Picks

Interesting Story of How the Idea Came from Chrome Nickel Steel-edged Shovels

THE idea of making chrome nickel steel picks was conceived when it was found that the Red Edge shovels made by the Wyoming Shovel Works, Wyoming, Pa., would wear sharper with use. For example, many railroads that are equipped with these track shovels use them for a full season on track work, and the following year they use them for what is known as weeding, that is, for cutting weeds along the right of way. They found them particularly good for this purpose because the constant wear in the ballast gives them a razor-like edge. It occurred to the officials of the Wyoming Shovel Works that if chrome nickel steel would wear this way in a thin sheet, there should be no reason why picks could not be made out of it which would wear sharper with use.

About the first of January, 1921, the first Red Edge picks were turned out, and, after a series of experiments to secure the best shape, the company claims to make a pick which will stand the hardest kind of wear and yet sharpen itself in the material which it penetrates. These picks are different from the usual kind of picks in several ways. First, they are forged out of solid billets of chrome nickel steel, and the arms are then heat-treated for almost their entire length. An ordinary pick is usually made of very soft metal to form the eye, and then high carbon steel points are welded onto this metal. Because of its very brittle nature, this high carbon steel can be hardened only for a fraction of an inch, otherwise the points would fly off at the first blow. As a result, a high carbon steel pick will last only a limited amount of time, usually one or two days at the most, when it is necessary to redress it. The steel back of the points is so soft that the constant application of blows tends to make it swell, or "bump up," as it is called, and when this is done the pick can no longer be used until it has been drawn out again by the blacksmith.

The Red Edge pick has the whole arm of uniform hardness. Characteristic of chrome nickel steel, however, is the fact that it has a combination of hardness and toughness, and it is this toughness which gives to the new picks their self-sharpening qualities. As the point

of the pick is driven into the material in which it is working, a lapping effect is set up, a sort of slow wearing away of the material on the outer side of the point, depending on the arc through which the pick is swung. When the pick has attained its shape, it holds it, and any further wear is distributed over the point in such a way that it continues to be sharp until perhaps several inches of the arm have been used up in this way. When this has happened,

it is possible to redress the picks and draw them out in much the same way in which the ordinary pick is worked except that the chrome nickel steel must



A CHROME NICKEL STEEL PICK

be quenched in oil instead of water to get the best results.

Another feature of these picks is their shape. They are made with oval arms instead of the usual square. This is claimed to give a much easier and deeper penetration and a quicker and cleaner withdrawal from the material.

The advantages claimed for this pick are, first, that the laborer is working at all times with a tool that is in proper condition and one with which he can get the best results. Since they are made in one solid bar, it is possible to have the eyes exactly in alignment with the points, making an accurately balanced pick which is easier to swing and which will never sting the hands. Another big saving comes in the fact that it is possible to do away with the expense of a blacksmith. The picks wear down so slowly that by the time they have reached the point where they should be redressed, enough has been saved in blacksmith charges to make it economical to discard them, although this is by no means necessary if the contractor should wish to have them redressed and continue to use them.

A number of jobs which have been equipped with Red Edge picks have done away with the blacksmith, and the contractor has told the manufacturer that the saving effected during the first week or ten days was more than enough to pay for the picks. The remainder of the time that they were in use was clear profit to the contractor, without taking into consideration the greater amount of work the men were able to do.

### The Value of Catalogs to a Contractor

Catalogs frequently contain cost data, construction methods, and tables for estimating which are of great value to the reader. Contractors should carefully read over the lists of catalogs on pages 61 and 62, and secure such material as will benefit them in their work.

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## Building Contracts Increasing

September Contracts in 27 States More Than in Any Previous September

**M**ORE contracts for building were awarded in the 27 states comprising the northeastern quarter of the United States in September than in any other month this year or in any other September of which there is a record. This is considered a most encouraging situation. Contract awards in September were  $11\frac{1}{2}$  per cent greater than in August.

Secretary Hoover, Chairman of the National Conference on Unemployment, and Colonel Arthur Wood, Chairman of the Committee on Community, Civic and Emergency Measures, are keeping in touch with the mayors' committees throughout the country to see in what measures the construction of buildings and improvements to public works and public utilities may help to give immediate work to men who need it.

The construction statistics mentioned include business buildings, educational buildings, hospitals and institutions, industrial buildings, military and naval buildings, public buildings, public works and public utilities, religious and memorial buildings, residential buildings, social and recreational buildings, and miscellaneous.

The New York district shows for September the largest contract award on the records of the F. W. Dodge Company's building statistics. Pittsburgh also shows a substantial increase. Chicago's decrease is much less than the normal seasonal decline, and Philadelphia's is about equal to the normal decline. Residential building leads all others, but the increase in business buildings is also of great significance. These figures cover the small towns and rural districts, as well as large cities.

Contemplated projects for September in the 27 northeastern states amounted to 10,455, with a valuation of \$318,030,600. Actual building contracts awarded in the month were 8,144, with a valuation of \$246,185,800. From January 1 to October 1 of this year, 57,056 contracts were awarded, valued at \$1,746,759,300.

Of this amount \$599,182,100 was for residential buildings, \$369,813,700 for public works and public utilities, \$254,237,300 for business buildings, \$186,374,700 for educational buildings, and \$122,658,900 for industrial buildings. The lowest figure was \$5,780,300 for military and naval buildings.

The actual number of residences contracted for in September was 8,185, and in the period from January to October 53,548.

The valuation of this year's contracts, to the first of October, was greater than in any previous year within a decade, except 1919 and 1920. Contracts awarded in 1920 amounted to \$2,145,353,000; in 1919 to \$1,824,990,000; in 1918 to \$1,335,526,000; in 1914 to \$579,042,000, and in 1910 to \$633,001,000.

Summarized statistics from the six districts in the Dodge report follow:

*Boston District (New England States)*—Contemplated projects, 1,404, value \$22,357,500; contracts awarded, 1,202, value \$16,026,000.

*New York District (New York State and Northern New Jersey)*—Contemplated, 2,550, value \$73,255,200; contracts, 1,966, value \$69,986,900.

*Philadelphia District (Eastern Pennsylvania, Maryland, Delaware, District of Columbia, Virginia, North and South Carolina)*—Contemplated, 1,739, value \$58,293,400; contracts, 1,333, value \$34,118,900.

*Pittsburgh District (Western Pennsylvania, West Virginia, Ohio, Kentucky and Tennessee)*—Contemplated, 1,264, value \$44,005,800; contracts 1,120, value \$40,885,100.

*Chicago District (Illinois, Indiana, Iowa, Wisconsin, Michigan, Missouri, and parts of Eastern Kansas and Nebraska)*—Contemplated, 2,757, value \$106,484,800; contracts, 2,022, value \$58,153,400.

*Minneapolis District (Minnesota and North and South Dakota)*—Contemplated, 741, value \$13,634,100; contracts, 501, value \$7,015,500.



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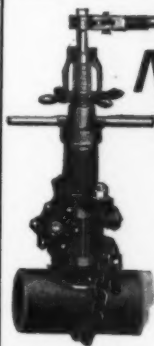
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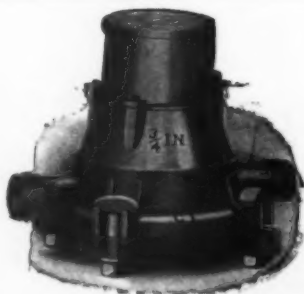
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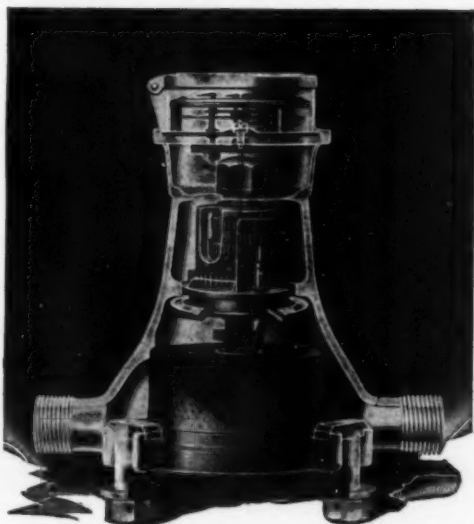


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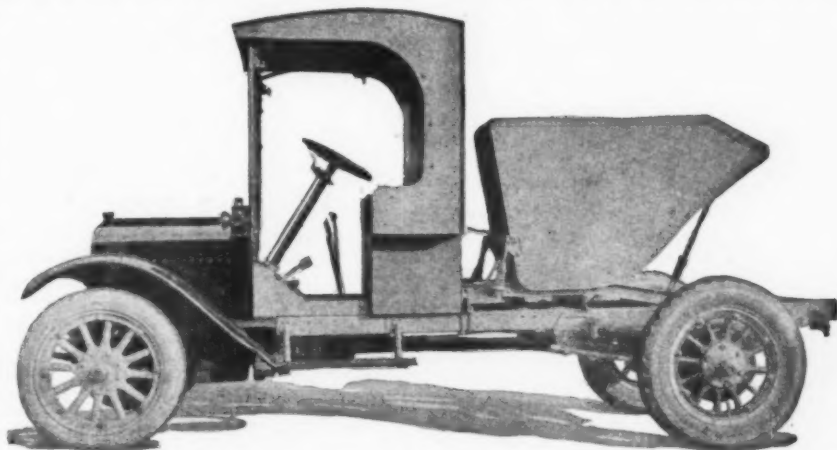
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